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PUBLIC INVOLVEMENT
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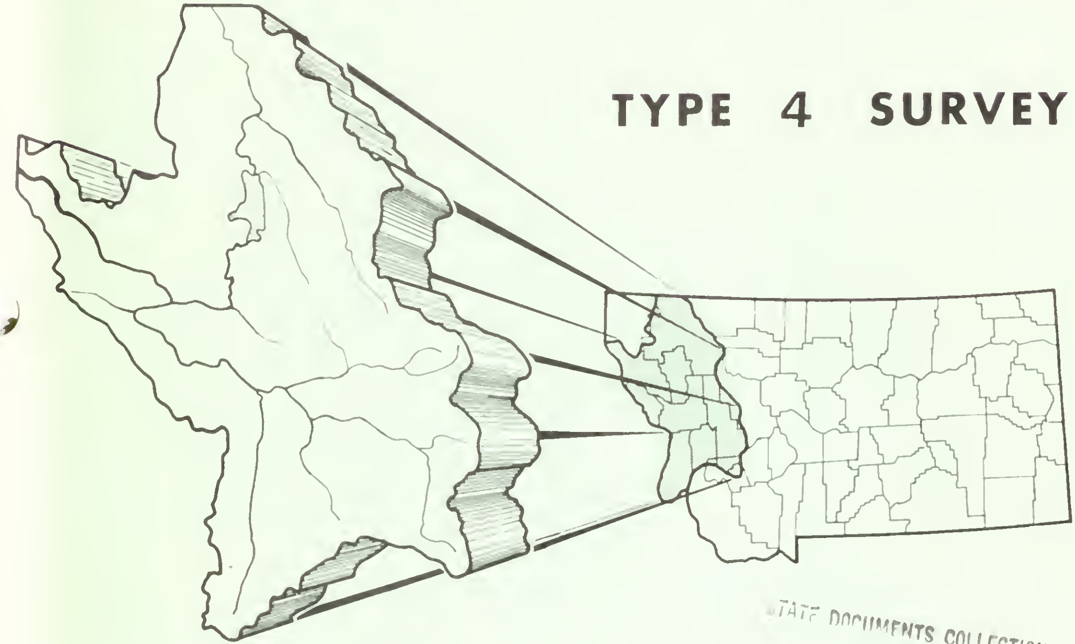
CLARK FORK OF THE COLUMBIA RIVER BASIN

TYPE 4 SURVEY



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II. INTRODUCTION

This report presents the findings of the USDA Type 4 River Basin study of the Clark Fork of the Columbia River in Montana. The study area includes all of Montana west of the continental divide except the drainage of the Kootenai River and its tributaries. See map II-1.

HOW AND WHY THE STUDY WAS INITIATED

The Montana Department of Natural Resources and Conservation (MDNR&C) requested the U. S. Department of Agriculture to cooperate in conducting a Type 4 study in this basin. The Department of Agriculture agreed to conduct this study under provisions of Section 6 of Public Law 566, as amended. Findings of the study are needed by the MDNR&C to help plan for the optimum use and development of the water and related land resources of the basin as part of the Montana State Water Plan. USDA agencies need the findings to identify water and related land resource problems, potential projects, ongoing programs that need acceleration, potentials for new programs, and assessment of capabilities and limitations of natural resources of the basin to meet the type, quantity, and quality of desired beneficial effects.

OBJECTIVES AND NATURE OF THE STUDY

Primary objectives of the study are to provide plans for rational use, development, management, and conservation of water and related land resources of the basin in a manner that will provide a balance between national economic development and environmental quality goals. Data are presented on land use, vegetation, grazing resources, wildlife habitat, outdoor recreational needs, conservation district programs, land treatment measures needed, potential Resource Conservation and Development measures, municipal and rural water and sewer development needs, forestry management and land treatment needs on federal and nonfederal forested lands, and potential rural electrification projects. Local organizations can sponsor the development of most of these potential projects under provisions of various land and water programs. The study provides valuable information to aid the orderly development of the region and enhancement of the quality of life for residents of the basin.

DESCRIPTION OF THE STUDY AREA

The basin includes all of Montana west of the continental divide except the Kootenai drainage. This includes all of Powell, Granite, Ravalli, Missoula, Mineral, Lake, and Sanders Counties, most of Flathead County, about half of Deer Lodge and Silver Bow Counties, and small parts of Lewis and Clark and Lincoln Counties. All the Flathead Indian Reservation and over half of Glacier National Park are in the basin. The basin is primarily mountainous and most of the basin is forested. There is an abundance of lakes and streams.

The basin is about 240 miles long from north to south and about 170 miles wide from east to west and contains about 21,597 square miles or 13,822,000 acres of land and water. Control of land and small water areas under 40 acres in size consists of: approximately 4,621,000 acres privately owned; 599,000 acres state-owned; 614,000 acres administered as Indian trust lands; and the remaining 7,988,000 acres, or 58 percent, are federally owned lands. There are about 656,000 acres in Glacier National Park and 6,846,000 in National Forests.

Elevations vary from about 2,175 feet above mean sea level at Cabinet Gorge Reservoir at the Montana-Idaho state line to about 10,665 feet on the higher peaks in the Pintlar Wilderness. See map II-2. Precipitation varies from over 100 inches annually on a few high peaks to about 10 inches in the upper part of the Deer Lodge Valley. Water yields range from about 100 inches annually in some small mountain areas to less than 4.5 inches in semiarid valley areas. The average annual measured discharge for the period 1928 to 1973 at Cabinet, Idaho, is about 16,080,000 acre-feet. There are no significant diversions into or out of the basin, but there is an average annual inflow of about 705,700 acre-feet from Canada in the North Fork of the Flathead River.

The Burlington Northern Railroad serves most of the basin area. The Chicago, Milwaukee, St. Paul and Pacific Railroad serves the southern part of the basin along the Clark Fork River. A branch of the Union Pacific Railroad serves Butte from the south. The Butte, Anaconda, and Pacific Railroad serves as the principal ore hauling road between Butte and Anaconda.

The basin is served by interstate highways 90 and 15 with considerable construction to be completed. Federal highways 2, 10, 10A and 12 cross the basin from east to west and U. S. 93 crosses from north to south. The main state primary highways include numbers 200, 28, 35, and 209. A good network of secondary highways and county roads serves the inhabited area.

The basin is fortunate in having the University of Montana at Missoula; Montana College of Mineral Science and Technology at Butte; and Flathead Valley Community College at Kalispell. Nearly every town has a high school and many of the larger towns have hospitals. The state prison at Deer Lodge, the state mental hospital at Warm Springs, and the state hospital for respiratory diseases at Galen are located in the Deer Lodge valley.

The economy of the basin is based on forest products, mining and metal reduction, agriculture, governmental and university activities, light industries, and tourism. About half the work force in the basin is employed in these basic industries. The other half of the work force is employed in associated support services and industries, including local outdoor recreation services. (Basic economic sector as used here includes those activities which produce goods or services that bring outside money into the basin.)

The forest products industry provided over 171 million dollars to the economy in 1969 while employing over 7,000 persons with an annual payroll of more than 47 million dollars. Value-wise, copper is the most important metal produced in the area, followed by zinc, lead, silver, and gold. Nonmetallic minerals include phosphorus, fluorspar, and quartz. Mining and concentration of ore are centered at Butte, while smelting and refining are completed at Anaconda. Alumina from outside the basin is reduced to aluminum at Columbia Falls. Phosphate rock is converted to agricultural chemicals and other products at Rocker near Butte. Agricultural production in the basin in 1969 included $38,376,000 in livestock and livestock products and $9,374,000 in cash crop sales for a total of

$47,750,000. Based on cost-return studies, these sales would provide about $15,000,000 in operators' disposable income. Governments employ about 4.3 percent of the labor force. About 3.9 percent of the labor force work in lodging and personal services, part of which is for tourism and recreation.

AGENCY RESPONSIBILITIES

During the study, the participating agencies were assigned specific responsibilities. Following is a list of the agencies and their responsibilities:

SOIL CONSERVATION SERVICE

The Soil Conservation Service had responsibilities for:

(1) Providing the chairman of the Field Advisory Committee, which provided guidance for the study.

(2) Assisting in an appraisal of water yield and consumptive use on present and potential developments.

(3) Making a physical appraisal of soils, land suitability, crops, and fish and wildlife resources for present and future uses.

(4) Determining the extent of floodwater, sediment deposition and erosion damage, including evaluation of floodwater and drainage damages and benefits, and evaluating benefits from multiple purpose water developments.

(5) Making physical appraisals, field investigations, and feasibility estimates for possible Public Law 566 small watershed projects and RC&D project measures and determining their relationship to other existing and potential water and related land resource developments.

(6) Determining land treatment and water management necessary to control erosion, prevent pollution, and provide for proper use of nonforested nonfederal lands.

(7) Cooperating and consulting with other agencies on land and watershed management programs.

(8) Appraising present recreational opportunities on all nonfederal lands.

(9) Assembling, reviewing, and evaluating data gathered, assisting in plan formulation and in the drafting of supplementary material for consideration of the Field Advisory Committee.

(10) Preparing the Type 4 River Basin Survey Report with assistance from the other agencies.

(11) Contributing to the economic base study and in its interpretation and application in the study.

ECONOMIC RESEARCH SERVICE

The Economic Research Service had the responsibility for the economic aspects and elements of basin planning. ERS, in cooperation with the other USDA agencies and the State of Montana, compiled economic data and made economic analyses, at varying levels of intensity, relating to the agricultural sector and its use of land and water resources. This included the following:

(1) Describing the economics of the area and the trends in its future development, stressing the economic effects of water and related land resource uses in the area. Preparing and completing a report on the economic base analysis and preliminary projections for use early in the study.

(2) Analyzing and projecting economic activity in the agricultural and related sectors with consideration of demand for agricultural goods and the interaction of demand and supply of resources.

(3) Analyzing the economic consequences of resource related problems such as floods, drought, and insufficient irrigation water supplies.

(4) Analyzing economic and institutional factors involved in the formulation of a coordinated plan and an analysis of alternative courses of action for water and related land resource use and management.

(5) Adapting available projections of the demand for and value of significant types of water-oriented outdoor recreation opportunities in the region to various areas in the basin.

(6) Assembling, reviewing, and evaluating data gathered, assisting in plan formulation and consideration of relevant alternatives, and drafting reports and supplementary material for consideration of the Field Advisory Committee.

FOREST SERVICE

The Forest Service had the responsibility for:

(1) Analyzing the forest resource sector of the economy and contributing to the economic base study prepared by ERS.

(2) Identifying the nature and quantity of measures required on national, state, and private forest lands for watershed protection, flood prevention, recreation, water yield improvement, and timber production.

(3) Cooperating with other agencies in estimating the impact of recreational development or activities on national, state, and private

forest lands and other federally administered lands. The interdependency of recreation activities on lands of various ownerships and locations was also studied.

(4) Cooperating with the MDNR&C Division of Forestry and the Conservation Districts in determining the needs for measures on state and privately owned forest lands.

(5) Determining present use and probable future needs for water on national, state, and private forest lands for administrative uses, industrial and other commercial uses, livestock and agriculture, recreational uses, and other uses, and appraising water needs of forest-based industries.

(6) Cooperating with the MDNR&C Division of Forestry and other agencies in reviewing and evaluating available published and unpublished data concerning soil and water resources of forested lands and in collecting additional basic physical data needed for the study.

(7) Collaborating with the SCS and the State in defining the watershed study areas and evaluating their characteristics, water yields, and contributions to floodwater and sedimentation problems.

(8) Collaborating with other land management agencies to determine present and future cover conditions and treatment needs for all forest and mountainous wild lands.

(9) Appraising prospective economic impacts of formulated development plans and alternatives.

(10) Assisting in interpretation of data, plan formulation, and in the drafting of a report and supplementary material for consideration of the Field Advisory Committee.

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

The Water Resources Division of the Montana Department of Natural Resources and Conservation assumed responsibility for the following aspects of the survey:

(1) Arranging for cooperation as needed with non-USDA federal agencies, state, and non-agriculturally oriented local agencies and provided for liaison with these agencies.

(2) Compiling and analyzing irrigated and irrigable land data and stream runoff information.

(3) Compiling information relating to water rights and the present use of water.

(4) Recommending opportunities for potential use of water and related land resources.

(5) Preparing summaries showing present status of water resource development and potential development.

(6) Coordinating the efforts of other state agencies providing data for the survey, including the Departments of Fish and Game, Health and Environmental Sciences, Agriculture, Lands; Bureau of Mines and Geology; Community Affairs; and the Conservation Districts Division and Forestry Division of MDNR&C.

(7) Determining the need for additional streamflow and precipitation information and making arrangements for its collection.

(8) Making arrangements with the Cooperative Extension Service for assistance on education and information matters.

(9) Assisting in interpretation of data, plan formulation, and in the drafting of a report and supplementary material for consideration of the Field Advisory Committee.

(10) Coordinating public involvement for the study.

ACKNOWLEDGEMENT OF DATA AND ASSISTANCE FROM OTHERS

Local entities, including conservation districts, irrigation and drainage districts, city-county planning boards, regional planning associations, other local authorities, newspapers, civic groups, and individuals provided:

(1) The continual identification of problems, needs, and opportunities related to land and water resource use and development.

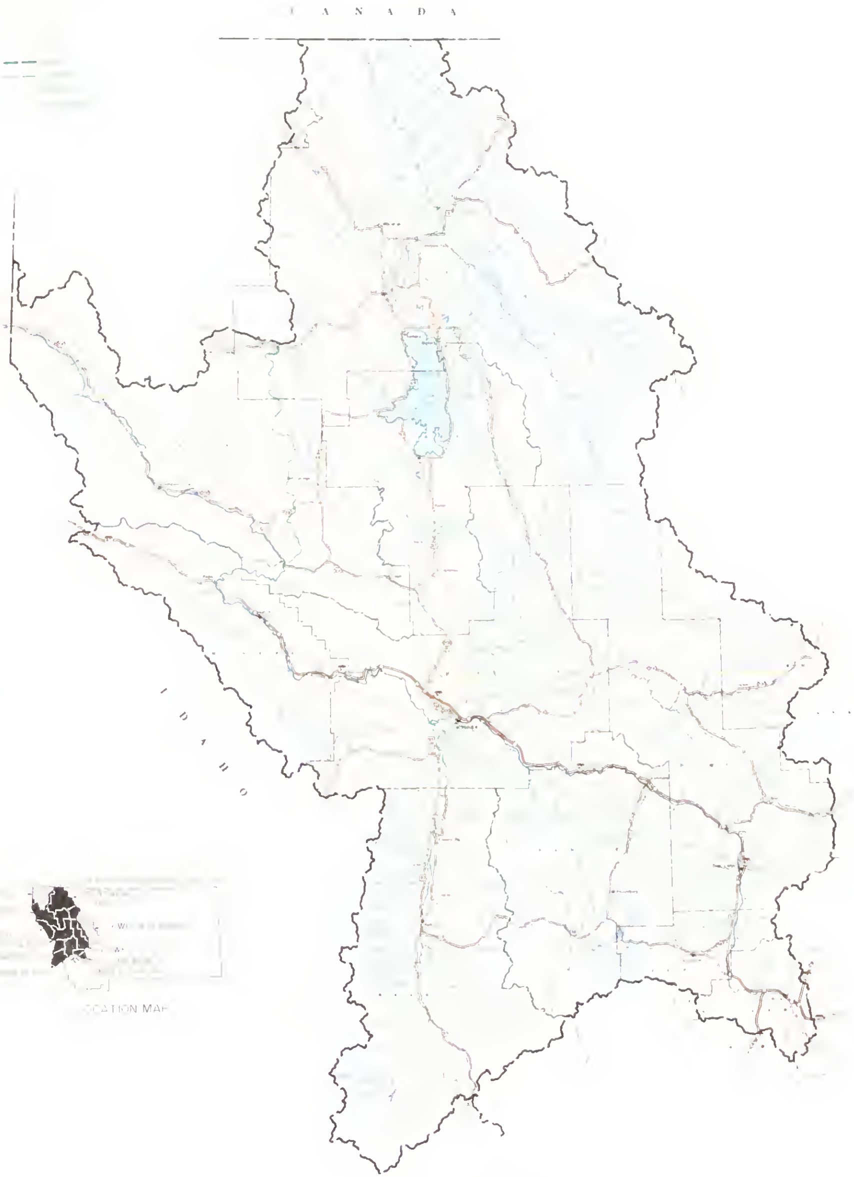
(2) Supplementary inventory inputs, as available, pertaining to yields by soil classification, soil and water management needs, farm plan development, local economic considerations, group facility developments, small livestock and irrigation water developments, present and proposed recreational use and developments.

Data and information available from other federal agencies were utilized to the fullest extent possible. Land classification surveys, economic data and hydrologic studies and project plans of the Bureau of Reclamation, Corps of Engineers, Bureau of Land Management, and the Bureau of Indian Affairs were reviewed and appropriate use and coordination made with information obtained from other sources. Reports of the Environmental Protection Agency were reviewed and studied with regard to their relationship to the survey area and the use and development of its water and related land resources. Climatological records of the Weather Bureau were used, as were hydrological records and studies of the Geological Survey.

Recreation information prepared by the Bureau of Outdoor Recreation and by the Recreation Data Subcommittee of the Pacific Northwest River Basins Commission was used in the study. Information obtained on private recreation facilities by and for the Conservation Districts was also used in the study.

The Montana Department of Fish and Game, the National Park Service, and Fish & Wildlife Service provided data on fish and wildlife needs and problems. Land use and management needs and plans of the Bureau of Land Management and the Bureau of Indian Affairs were coordinated with field observations and information from other sources. Assistance was obtained from the Farmers Home Administration and Montana Department of Health and Environmental Sciences to establish the need for rural community water supply and sewage improvements. The Rural Electrification Administration and REA cooperatives were consulted in relation to development needs in rural areas. Agricultural statistics were provided by the Statistical Reporting Service and Agricultural Stabilization and Conservation Service.

Numerous other organizations, both private and public, contributed to the study and their assistance is appreciated.



MAP II-1

PROJECT MAP

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

AUGUST 1976

10 0 10 20 30 40 50 MILES

SCALE 1:2 000 000

Base map prepared by SCS Portland Cartographic Unit.

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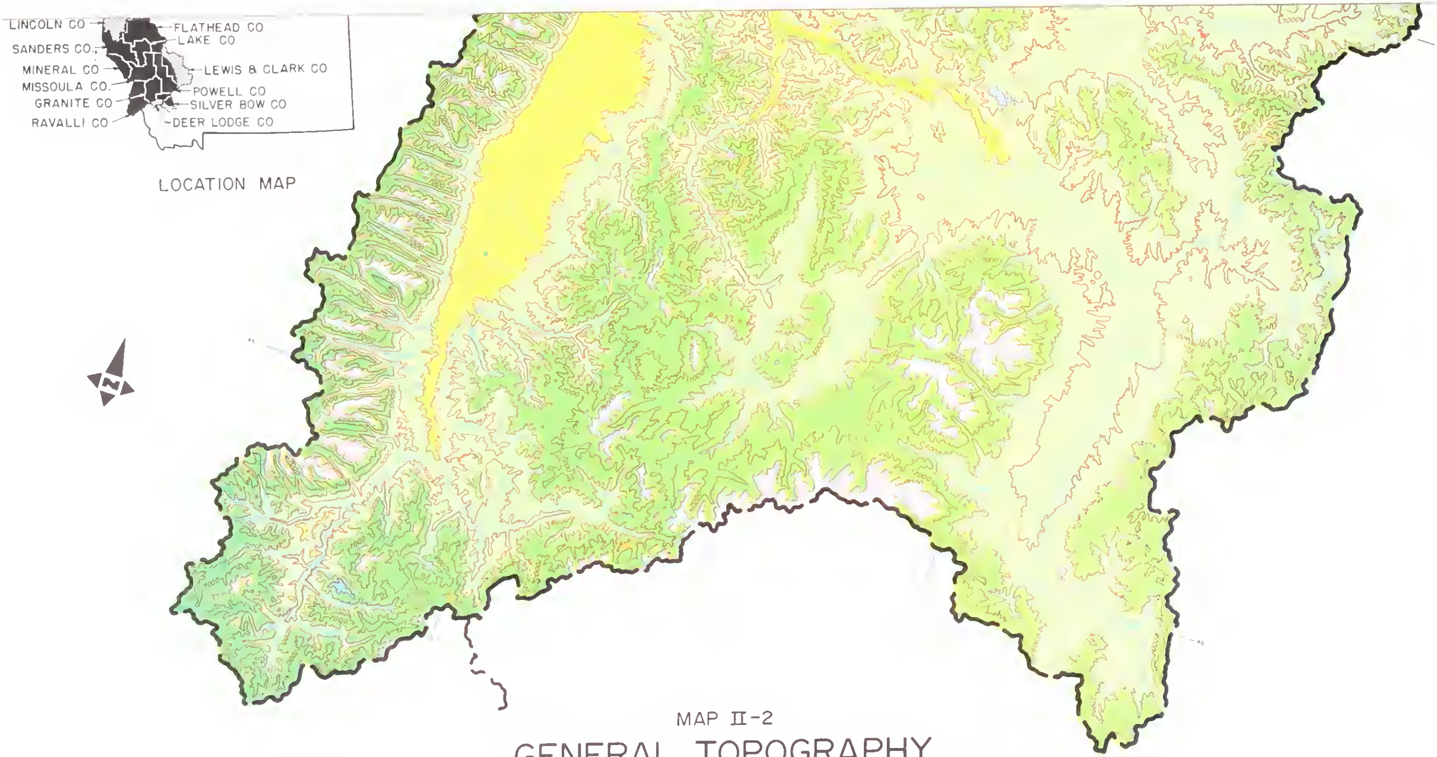

MAP II-2

GENERAL TOPOGRAPHY

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JULY 1976

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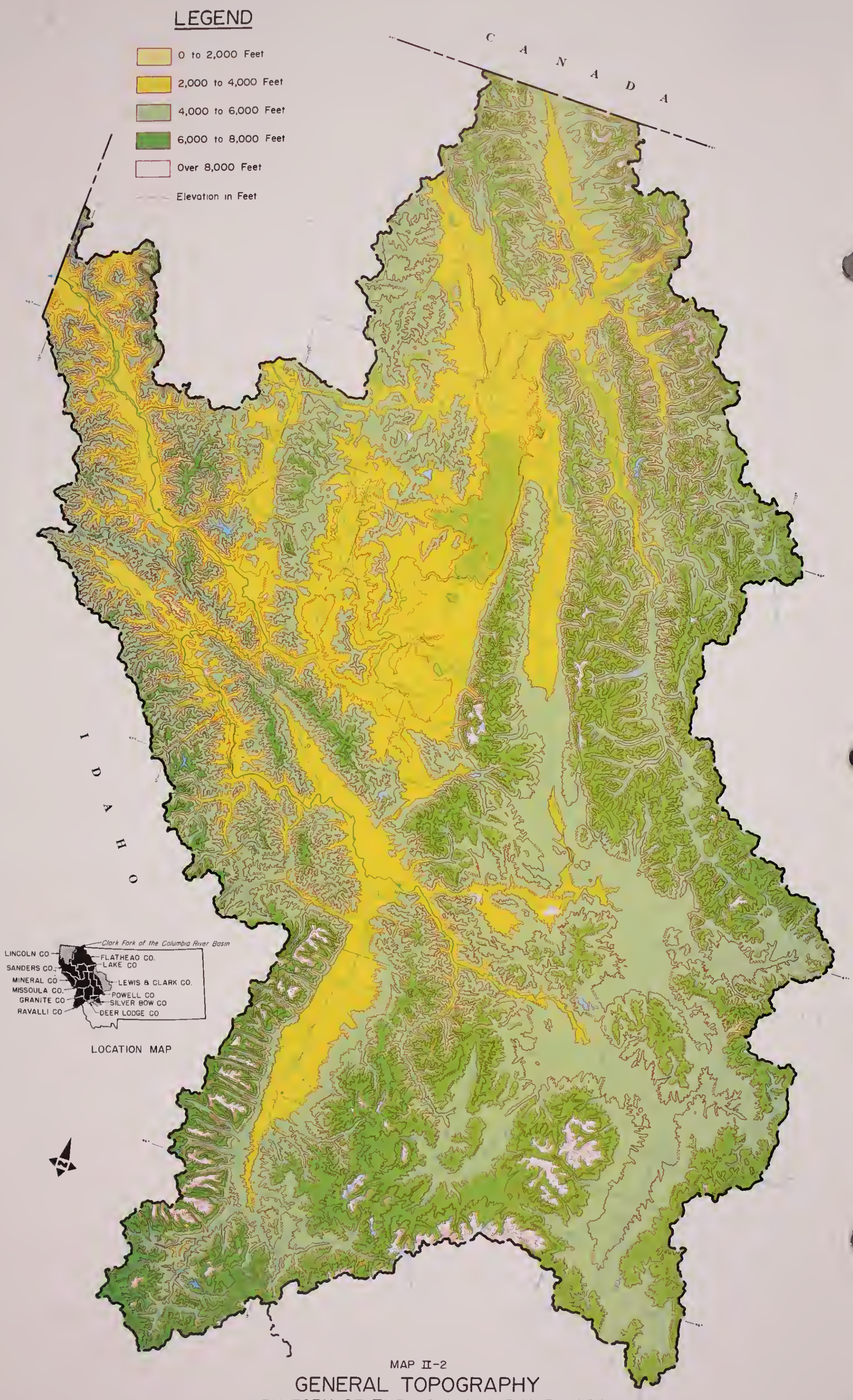
US DEPARTMENT OF AGRICULTURE



MAP II-2

GENERAL TOPOGRAPHY

CLARK FORK OF THE COLUMBIA RIVER BASIN

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JULY 1976

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III. PROBLEMS AND OBJECTIVES

INTRODUCTION

This chapter presents the public concerns which precipitated the study, delineates the problems identified during the study, and enumerates the desired objectives for resource development and environmental conditions for future timeframes.

During the development of the plan of work for this study, maximum use was made of existing information to identify problems and potentials for resource management and development. Data were used from the Columbia-North Pacific Comprehensive Framework study, Resource Conservation and Development project plans, historical flood records, local planning agency reports, state and federal agency reports, and many private sources. Public involvement meetings were held at 15 different locations in the basin to explain the scope of the study and to elicit public input in identifying problems, potentials, and desires related to water and associated land resources. Data from these sources are presented in this report for the three economic or hydrologic subareas: Upper Clark Fork, Lower Clark Fork, and Flathead as shown in map III-1.

The overall goal of this planning activity is to provide guidance and alternatives in the wise use of water and land resources to improve the quality of life in the basin through achieving a balance between economic development and environmental quality objectives.

Problems and desires were categorized under the two major objectives defined by the U. S. Water Resources Council as national economic development (NED) and environmental quality (EQ). The national economic development objective includes increasing the value of goods or services derived from planned development to maintain the basin's share of the national production of food, fiber, and recreational opportunities.

Examples within the NED objective include:

a. Increased crop production through more efficient use of resources, increased supplies of water, and further development of irrigated and dry cropland.

b. Improved timber production and use of existing wood resources.

c. Improved recreational opportunities in both a quantitative and qualitative sense.

d. Increased peaking capacity in power generation and transmission systems.

e. Improved municipal and industrial water supplies.

f. Improved efficiency in resource use by producing the same amount of goods with less resources or more goods with the same resources. Improved efficiency generally releases some resources to produce other goods or services elsewhere in the economy.

g. Additional NED effects occur as secondary or external economies. For example, increased crop production may improve the economy of the transportation industry by making fuller use of its facilities and providing added employment for unemployed or underemployed residents of the area.

Problems and desires under the EQ objective are more concerned with the management, conservation, preservation, and enhancement of certain natural and cultural resources and ecological systems in the area under study and elsewhere in the nation. Consideration of EQ enhancement as an objective in planning is explicit recognition of these public desires.

Examples within the EQ objective include:

a. Managing, protecting, and enhancing areas of natural beauty such as open and green spaces, wild and scenic rivers, lakes, beaches, and mountainous wilderness areas.

b. Preserving and enhancing outstanding archeological, historical, biological, and geological resources and ecological systems.

c. Enhancing quality aspects of water, land, and air by controlling pollution, preventing erosion, and restoring eroded areas.

d. Avoiding irreversible commitments of resources to uses that produce undesirable and possibly irreversible changes in the natural environment.

PROBLEMS

Economic Development Problems

(1)* General economic development problems identified through public involvement and during the course of the study are somewhat different for the three subareas. All three areas are experiencing a change in their natural resource base. The degree of intensity and rate of change vary. In the Upper Clark Fork subarea, the greatest dependency is on mining and metal reduction. A modest decline in world copper prices, changes in technology, and depletion of highest grade ores are reducing the employment and population of the area. Some employment losses are attributable to new technology which replaces labor with capital investment. In the Flathead subarea, there is a decline in the area of commercial forests for a number of reasons and considerable acreages of arable land have moved out of agricultural use into subdivisions. In the Lower Clark Fork subarea, declines in both commercial forests and arable land are occurring with potentially more drastic effects because the area has relatively less acreage of arable land and greater employment in the wood and paper products manufacturing than does the Flathead subarea. Thus, we see a decline in the natural resource base in all three subareas which could seriously alter the economic stability of the study area.

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*The numbered items in parentheses appear throughout the report to assist the reader. The numbers are the same in each chapter and appear the same on the summary tables.

In 1970 total per capita income in the study area was $3,025 compared with $3,381 for Montana and $3,921 for the United States.1/ These figures indicate that per capita income is 23 percent below the national average.

Floodwater Damages

(2) Large floods of generally basin-wide significance have occurred in the Columbia drainage in 1894, 1908, 1948, 1964, 1974, and 1975. The flooding in 1908 and 1964 was particularly severe in terms of economic loss, especially to transportation systems.

1/ U. S. Department of Commerce--Regional Economics Information System

Agricultural Damages

Flooding has generally affected acres of agricultural land along the mainstem of the Bitterroot River from Sula to its confluence with the Clark Fork. Another acres along the mainstem of the Clark Fork are flooded at frequent intervals. Along the Flathead mainstem, acres are flooded less frequently. Most of the tributary streams produce less serious damages. About acres along the Little Blackfoot, acres along the Blackfoot, acres along Warm Springs Creek, and acres along Cottonwood Creek are occasionally flooded. Damages to irrigation ditches and diversions, fences, roads, culverts, and bridges are more costly than damages to crops and pasture because most flooding occurs during spring snowmelt runoff before crops are growing.

Urban and Residential Damages

The most serious urban and residential flood damages have been associated with major floods on the larger rivers. Along the Flathead River, significant flood damages have occurred at Columbia Falls and the unincorporated community of Evergreen. The Clark Fork has flooded the Orchard Homes area near Missoula. Other areas in the basin that have experienced some degree of flood damage in the past are Deer Lodge (Cottonwood Creek); St. Regis (St. Regis River); Lincoln (Blackfoot River); Lolo (Lolo Creek); Butte (Sand Creek and Blacktail Deer Creek); Anaconda (Warm Springs Creek); Swan River subdivisions (Swan River below Swan Lake); Missoula (Pattee Creek, Rattlesnake Creek, and Grant Creek); Kalispell (Spring Creek); and Drummond (Edwards Gulch). Most of these floods are caused by snowmelt, although some are caused by ice jams and occasionally by heavy rains. Residential encroachment on flood plains is continuing.

Impaired Drainage

(3) Areas with low production because of impaired drainage associated with irrigation were identified along the Little Bitterroot, Flathead, Clark Fork, and Bitterroot Rivers, on Camas Prairie, on the Flathead Irrigation Project, Nevada Creek, and along Flint Creek. Some other wet areas occur naturally. These high water table problems stem from excessive irrigation, canal seepage, and lack of adequate drainage outlets. About 90,000 acres of the two types of drainable wetlands were inventoried. See map III-2. "Type 1 wetlands are defined as Seasonally flooded basins and flats. The soil is covered with water or is waterlogged during variable seasonal periods but usually is well drained during much of the growing season. Type 2 wetlands are defined as Inland fresh meadows. The soil usually is without standing water during most of the growing season but is waterlogged within at least a few inches of its surface." 1/

Water Shortages

(4) Specific problems of late season or temporal shortage of irrigation water were identified in the Flathead Irrigation Project, Flint Creek, Deer Lodge Valley, part of the Bitterroot Valley, Blackfoot and Little Blackfoot Valleys, and upper Flathead Valley. About 208,000 acres now irrigated have some late season shortages. For acreages and shortages of water, see table III-1.

1/ Direct quote from EVT-39.

TABLE III-1

Irrigated Lands With Water Shortages

Water shortages due to low irrigation delivery efficiencies arise from numerous small private developments with a poor ratio of acres irrigated per mile of canal. In such instances, very little canal lining has been installed and ditch seepage losses are high. Rough topography, small acreages served, differences in water appropriation dates, and personal attitudes tend to hinder further ditch consolidation or improvements in structural measures. However, most of the water lost in transmission returns to the stream system and is diverted over and over so that the overall efficiencies of the stream systems are actually not as low as they first appear, even though dewatering occurs in short reaches of many smaller streams.

Livestock and rural domestic water supply is generally adequate in quantity and quality, but some further development of springs, ponds, and wells is needed for better grazing distribution on rangeland.

(5) While drinking water quality for municipalities in the basin is generally good to excellent, some water sources have taste, odor, and color (sediment) problems. Few municipalities experience problems with water quantity, but problems of inadequate storage and distribution systems are widespread in the basin. Table III-2 lists the communities having problems with their systems and the needs of each. In addition, several communities now have no public water supply system, but should develop one to meet future needs.

Phreatophytes on ditch banks are a minor problem in irrigation projects, but do benefit wildlife. Phreatophytes along natural waterways are not considered a serious problem in this basin.

TABLE III-2--MUNICIPAL WATER PROBLEMS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Community	Problems
Butte	Uncovered west side reservoir
Deer Lodge	Short supply and lack of chlorination
Phillipsburg	Pipelines too small
Drummond	Lacks a central system
Garrison	Lacks a central system
Hamilton	Inadequate supply
Stevensville	Seasonal turbidity in surface supply
Missoula	Seasonal turbidity in surface supply
Alberton	Inadequate supply and distribution system
Superior	Inadequate distribution system
Essex	Inadequate distribution system
West Glacier	Inadequate supply and storage
Coram	Inadequate storage and distribution
Martin City	Inadequate supply, equipment, and distribution
Columbia Falls	Inadequate storage for ground-water supply
Somers	Inadequate supply
Red Gate	Inadequate equipment and distribution
Lakeside	Inadequate distribution
Hot Springs	Inadequate storage and distribution
Ronan	Inadequate supply and distribution
St. Ignatius	Two systems for one community
Plains	Inadequate supply
Thompson Falls	Seasonal turbidity and inadequate supply
Trout Creek	Inadequate storage

Source: Montana Department of Natural Resources and Conservation and
Montana Department of Health and Environmental Sciences

Range and Forest Fires

The control of range and forest fires is the responsibility of the Forest Service, Bureau of Land Management, and National Park Service on lands under their administration. On state and private lands, fires are generally fought under the direction of the Forestry Division, Montana Department of Natural Resources and Conservation, with assistance of the Forest Service. All range and forest fire protection on the Flathead Indian Reservation is provided by the tribal council. The state contracts with the tribe for protection on state lands lying within the reservation.

Recreation Shortages

Problems related to outdoor recreation in the study area include:

(6) Imbalanced supply of recreation facilities on public land. The location, types, and standards of existing facilities do not satisfy current preferences.

(7) Insufficient supply of recreational facilities in and near urban areas.

(8) Low income of many private outdoor recreation enterprises.

(9) Insufficient number of entry points onto public lands, streams, and lakes. This limited access results in over-concentrated use in certain areas of the basin.

(10) Difficult boating access on some lakes and reservoirs with fluctuating water levels. Recreational problems associated with fluctuating water levels have been identified in the following lakes and reservoirs: Whitefish, Flathead, Little Bitterroot, Ashley, Como, Nine-Pipe, Hungry

Horse, Painted Rocks, East Fork Rock Creek, and Georgetown. This is partly because most of the reservoirs and lake level control structures were not built for recreational purposes. The kettle lakes area north of Bigfork has a rising water table that is inundating boat docks and structures built too close to the lake shores. Other than these problems, the basin is well endowed with outdoor recreation opportunities on water, forest, or wilderness sites.

Shortages of urban recreational facilities are another matter. The Montana Department of Fish and Game conducted a statewide survey of urban recreation programs and facilities in 1973. That study found the following shortages of facilities in the basin.

Facility	Additional Number Needed
Baseball fields	14
Outdoor basketball courts	14
Outdoor tennis courts	11
Swimming areas	1
Wading pools	9
Stages	1
Meeting rooms	1
Playgrounds	3
Picnic areas	4
Gymnasiums	3
Craft rooms	2
Handball courts	6

Improper Land Management and Use

(11) Poor land management such as overgrazing, lack of weed control, and failure to prevent erosion reduces agricultural production. Some of the reasons for poor land management stem from smaller than economic farm units that have insufficient income to apply adequate land treatment. Other reasons include rural residents without equipment or knowledge of land treatment and often with more livestock than their small acreages

can support. Much of the tribal-owned rangeland on the Flathead Indian Reservation is overgrazed and needs better management. In areas with timber rotation cycles greater than 60 years, many timber land management practices are not economically feasible as based on increased production and current lumber prices.

(11a) About 302,000 acres out of 431,700 acres now irrigated are not producing up to their agricultural potential. Of these, acres need sprinkler systems, acres need water management, including miles of improved field ditches.

(11b) Problems on dryland are more related to erosion and sediment production than to crop production and are discussed under EQ problems.

(11c) Range management problems are directly related to lower than potential forage production and some areas are overgrazed to the point of being erosion hazards. About acres are in need of planned grazing systems, including deferred grazing. An additional stockwater developments and miles of fence are needed.

(11d) Forested lands producing less than their economic potential include 4,200,000 acres out of 7,823,000 acres of total commercial forest. This less than potential production contributes to the depressed level of income in the basin.

(12) "Other" lands such as farmsteads, roads, subdivisions, gravel bars, and industrial sites need protection from erosion. Critical area treatment is needed on 84,000 acres of other lands.

Forest Industry Problems

(13) Amounts of large diameter timber are decreasing. This problem is aggravated because most mills are adapted to sawing lumber for

which the timber supply is limited.

(14) Much of the available wood is unused or wasted.

(15) Most of the wood products leave the basin in a semi-finished or unfinished state. This limits the employment that could be realized in the timber industry in the basin.

Energy Facility Problems

(16) At present, the basin is a net importer of electrical power and has no developed natural gas, petroleum, or coal. There are some minor deposits of these fossil fuels in proximity to Glacier National Park, but it is unknown whether they will ever be developed. There is a current shortage of electrical transmission facilities on the Flathead Irrigation Project to the extent that it causes delays in initially filling requests for sprinkler irrigation power facilities. If all the acres needing conversion to pump sprinkler irrigation are to be supplied power, and if housing and industry are developed to accommodate the projected increase in population, then more electricity will have to be provided.

Environmental Quality Problems

Individuals, agencies, and the general public have become more and more aware of existing undesirable environmental conditions and of ongoing deterioration of natural resources. Certain segments of the public have become less willing to accept environmental deterioration in exchange for additional goods and services in the marketplace. EQ problems identified here are expressions of that concern.

Erosion Damage and Sediment Production

(1) Erosion and sediment cause reductions in environmental quality. About 173,000 acres of dryland out of 307,000 acres are identified as inadequately protected. About 84,000 acres of "other" lands out of 147,200 acres need protection from erosion. "Other" lands include farm roads, farmsteads, rural residential tracts, subdivisions, industrial tracts, and barren lands. Much of the 1,000,000 acres of inadequately treated range is in danger of erosion. However, very little agricultural production is being lost because of erosion. Approximately 62,000 acres of forested land and 2,500 miles of trails, roads, and streambanks on forested land are inadequately protected from erosion.

(2) Erosion and sediment production are largely functions of soil characteristics. Two drainages in the basin are particularly erosive. They are the Little Bitterroot in Sanders County and the upper Blackfoot in Lewis and Clark and Powell Counties. Most of their sediment load comes from bank erosion on the mainstem and larger tributaries during spring runoff. Forest harvest, haul roads, highways, utility lines, and recreation use also disrupt the natural ground cover and tend to contribute to increased runoff and erosion. See map III-3.

High sediment loads reduce the life of downstream reservoirs by replacing water storage capacity with mud and sand. Finer sediments adversely affect stream fisheries by filling the gravel spaces needed for aquatic organisms and fish spawning activity. In municipal watersheds, sediments reduce water quality. Siltation, sedimentation, and increased runoff result from poor logging and agricultural practices. Agricultural sediments often carry pesticides and other agricultural chemicals into the streams.

Pollution

Water pollution problems by type and source were identified by the Montana Department of Health and Environmental Sciences and Montana Department of Fish and Game. See appendix table III-1. The degree of effects varies from mild to very severe in terms of aquatic habitat, recreational use, and visual appearance. The types of pollution identified include both point-source and non-point-source pollution.

(3) Point-source pollution is mostly sewage effluent and industrial wastes, including harmful chemicals and nutrients. Municipal and industrially caused water pollution are identified in table III-3. In some locations, legal requirements for pollution control are not being met.

(4) Non-point-source pollution is mostly borne in runoff from agricultural, rural residential, and forested areas. Water carries sediments, harmful chemicals, and excessive nutrients into streams and lakes. This type of pollution results from poor practices such as overgrazing, poor irrigation water management, and poor timber harvest practices.

(5) Air pollution is not serious except in isolated areas. Fluorides from aluminum smelting at Columbia Falls and phosphate refining at Rocker are being reduced with new technology. Wood waste burning is decreasing. Sulphides from the paper mill near Missoula and copper smelter near Anaconda are being reduced.

Impairment of Natural Beauty

Problems listed here which relate to impairment of natural beauty are those most often mentioned at public involvement meetings. Agreement on quantification of these problems is difficult because natural beauty is subjective from person to person.

TABLE III-3--MUNICIPAL AND INDUSTRIAL WATER POLLUTION PROBLEMS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Problem	Location		
Communities without central sewage facilities	Evergreen	Lolo	Georgetown Lake
	Lakeside	Swan Lake	Red Gate--Woods Bay
	Garrison	Ovando	Corvallis
	Somers	Arlee	Seeley Lake
	Victor	Ravalli	Opportunity
	Plains	Lincoln	
	Rocker	W. Valley--Anaconda	
Communities without central secondary treatment	Polson	Darby	St. Ignatius
	Deer Lodge	Stevensville	Thompson Falls
	Drummond	Alberton	Whitefish
	Superior	Hot Springs	Elmo
	Hamilton	Phillipsburg	Ronan
	Charlo		
	Lolo Development		
	Kicking Horse Job Corps Center		
	Warm Springs State Hospital		
Industrial pollution			
Occasional spills from ponds near Warm Springs cause fishkills in Upper Clarks Fork River	Anaconda Company		
Chemical discharges in Warm Springs Creek and Silver Bow Creek			
Cooling water discharges cause thermal pollution	U. S. Plywood, Bonner		
Sawmill waste leachate	Forest Products, Inc., Kalispell		
Mill discharges	Hoerner Waldorf, Missoula		
Organic wastes	Daily's Meats, Missoula		
Mill discharges	Diamond Match, Superior		
Organic wastes	Consolidated Dairies, Ronan		

Data Source: Montana Department of Health and Environmental Sciences

(6) Fluctuating water levels in flood control reservoirs expose barren areas and mudflats. Dams, dikes, and riprap which are installed to control flood flows are considered by many as impairments to natural beauty. Conversely, without these structures, uncontrolled floods deposit unsightly debris, mud, and dirty water along flood plains.

(7) Agricultural, residential, and road encroachment on rivers, streams, and lakes has partially eliminated riparian vegetation in the basin.

(8) An insufficient number of access points on public lands, including wilderness and roadless areas, causes excessive use around existing access points. Destruction of vegetation, rutted trails, and litter in and around these areas impair the natural beauty.

(9) Natural open and green space has been adversely affected from a visual aspect by clearcutting in large blocks. Overgrazing and failure to prevent wind and water erosion also impair natural beauty.

(10) Flood control, hydroelectric, and irrigation storage reservoirs have impounded segments of previously free-flowing streams.

(11) Poorly designed roads and utility lines detract from the natural beauty with exposed cuts and structures that contrast with the mountainous and forest scenery.

Fish and Wildlife Habitat Damage and Shortages

(12) Fish and wildlife habitat problems were identified by biologists and private individuals. Damages to the aquatic systems in the basin are due mainly to artificial dewatering of streams by irrigation water diversions. Low flows damage fish through loss of spawning and living habitat, and seriously damage the food organisms upon which the fish populations depend.

(13) Fluctuating stream water levels and sudden water temperature changes are caused by power generation releases from Hungry Horse Reservoir. These daily changes disrupt spawning activity and aquatic food production in about 41 miles of the South Fork and mainstem of the Flathead River.

(14) Wildlife shortages in the basin are expressed by the public as a rapid decline in populations of big game animals and waterfowl. There are probably many associated reasons for the population declines, but loss and deterioration of habitat appears to be one of the major causes. Areas of big game winter range are decreasing due to land use changes such as subdivision encroachment and increasing grazing pressure by domestic livestock. Waterfowl habitat is decreasing due to drainage of wetland and use of adjacent feeding grounds. Many forms of wildlife are disrupted by residential encroachment on riparian habitat. Upland game populations seem to be declining due to habitat loss associated with modern farming practices and changes in cropping patterns which includes less grain farming in irrigated areas.

(15) Instream structures such as the Bigfork diversion dam, are barriers to upstream migration of fish. The present fish ladder is ineffective due to improper installation.

(16) Historical and archeological sites are being destroyed.

OBJECTIVES

The procedures used in this river basin study followed the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources. Under those procedures, equal importance was given to economic development and environmental quality. Problem situations were enumerated under the NED and EQ categories. The overall planning objective is to devise means of coping with these problems within the limits of resources during selected timeframes. In this intermediate planning, emphasis is on the target date of 1990 for most planning items and 2020 for longer-range, less intensively planned items.

The major objectives of this planning effort are:

a. to enhance national economic development by increasing the value of the nation's output of goods and services and improving national economic efficiency.

b. to enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

The first level components of the major objectives as defined for this river basin for national economic development are:

a. Increased output of food and fiber and more efficient use of resources.

b. Improved and increased recreational opportunities.

c. Sustained and efficient use of resources.

d. Sustained and improved forest products industry.

e. Adequate supply of energy.

For environmental quality, the first level components are:

a. Enhancement of quality aspects of water, land, and air.

b. Management and protection of areas of natural beauty and human enjoyment.

c. Enhancement or preservation of biological resources.

The second or detailed level components of objectives are listed in the remainder of this chapter.

National Economic Development Objectives

The following second level specific components have been identified to improve economic development of the basin.

1. Sustained basic industrial employment.
2. Reduced flood damages on agricultural lands and residential areas.
3. Increased production on Type 1 and Type 2 wetlands.
4. Storage of spring runoff water to offset temporal shortages for irrigated land now short of late season water and improved irrigation distribution systems where feasible.
5. Improved municipal water supply systems.
6. Adjusted supply, kind, and quality of recreational facilities and recreation management on public land to satisfy current preferences.
7. Additional urban recreational facilities as needed.
8. Increased economic education and technical assistance to owners of private outdoor recreation enterprises.
9. Dispersed recreational activity by providing additional access points and fisherman pathway easements along streams and additional access points to public lands in areas now blocked by private land.
10. Recreational facilities adapted to fluctuating water levels on reservoirs.
11. Improved efficiency of agricultural and commercial forestry

production by improved land treatment, including: irrigation water management with sprinkler irrigation, water control structures, improved field ditches and pipelines; improving range management by developing more stockwater facilities and building more fences; improving wood growth through thinning and selective harvest.

12. Critical area treatment on "other" lands now eroding or endangered.
13. More sawtimber-sized trees.
14. Expanded use of available wood.
15. Diversification of forest products industry.
16. Adequate electrical power and transmission lines.

Environmental Quality Objectives

The following second level specific components have been identified to improve and protect environmental quality in the basin.

1. Reduced erosion and sedimentation from range, cropland, forest, and other lands.
2. Reduced streambank erosion.
3. Reduced discharge of sewage effluent and industrial pollutants.
4. Reduced chemical, nutrient, and thermal pollution from agricultural and forested lands.
5. Reduced air pollution.
6. Reduced water fluctuations of reservoirs.
7. Protected riparian vegetation along streams and lakes.
8. Additional access to public lands.
9. Protected open and green space.

10. Free-flowing streams.

11. Planned road and utility line location and construction.

12. Adequate minimum streamflows.

13. Temperature control and reduced daily fluctuations of discharges from Hungry Horse Reservoir.

14. Adequate big game, upland, and wetland wildlife habitat.

15. Desirable fish migrations.

16. Protected historical, cultural, and archeological sites.

CHAPTER III--SUMMARY TABLE--PROBLEMS AND OBJECTIVES

Primary Objective	Problems (Public Concerns)	Specific Components of the Objectives: First Level (Desires)	Specific Components of the Objectives: Second Level (Preferences)
National Economic Development	1. Natural resource base declining in all 3 subareas.	Increased output of food and fiber and more efficient use of resources.	1. Wise use of resources in maintaining basic industry employment.
	2. Flood damages on acres of agricultural land and on acres of residential land.		2. Reduced flood damages to agricultural and residential areas.
	3. Wetland drainage needed on 90,000 acres of Types 1 and 2 wetlands.		3. Improved use of reclainable wetlands.
	4. Late season water shortage on 208,000 acres of irrigated lands.		4. Full season water supply for irrigated land.
	5. Municipal water problems at 17 communities.		5. Adequate water supplies and systems for all communities.
	6. Location and types of facilities do not satisfy current preferences.	Improved and increased recreational opportunities.	6. Adequate type and properly located recreation facilities and management to meet current preferences.
	7. Shortage of urban recreational facilities.		7. Adequate supply of urban recreational facilities as needed.
	8. Low income of many private outdoor recreation enterprises.		8. Better economic education and technical assistance for private recreation.
	9. Shortage of access points to public land, streams, and lakes.		9. Provide additional access points to public land, streams, and lakes and fisherman pathway easements along streams.
	10. Difficult boating access to some lakes and reservoirs with fluctuating water levels.		10. Provide boat ramps and docks adaptable to fluctuating water levels

CHAPTER III--SUMMARY TABLE--PROBLEMS AND OBJECTIVES (Continued

Primary Objective	Problems (Public Concerns)	Specific Components of the Objectives	
		First Level (Desires)	Second Level (Preferences)
National Economic Development (Continued)	11. Poor land management results in lower than potential production on 302,000 acres of irrigated land; 1,000,000 acres of rangeland; and 4,200,000 acres of commercial forest land.	Sustained and efficient use of resources.	11. Improve efficiency of agricultural and forestry production through improved land treatment and management.
	12. About 84,000 acres of "other" lands are in danger of erosion.		12. Protect "other" land from erosion damage by land treatment measures.
	Forest Industry Problems:		
	13. Amounts of large-diameter timber are decreasing. 14. Much of available wood is unused or wasted. 15. Most wood products leave the basin in a semi-finished or unfinished condition.	Sustained and improved forest products industry.	13. Grow more sawtimber-sized trees. 14. Expand use of available wood. 15. Increase employment through diversification of forest products industry.
	16. Basin is net importer of electricity and other energy and will need more transmission facilities in future.	Adequate supply of energy.	16. Locate routes for new electrical transmission lines.

CHAPTER III--SUMMARY TABLE--PROBLEMS AND OBJECTIVES (Continued

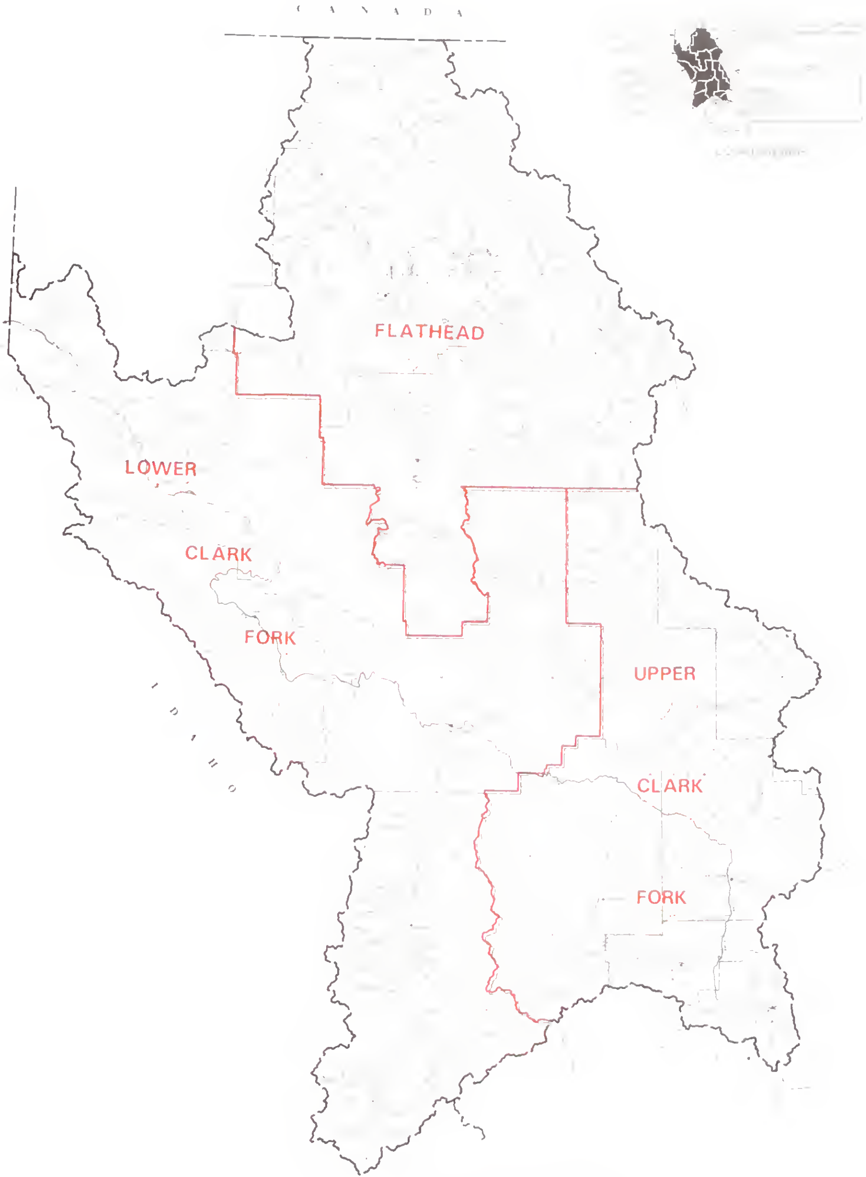
Primary Objective	Problems (Public Concerns)	Specific Components of the Objectives	
		First Level (Desires)	Second Level (Preferences)
Environmental Quality	1. Sediment from 1,319,000 acres of erosive lands and 2,500 miles of eroding forest trails, roads, and gullies is polluting streams and lakes.	Enhancement of quality aspects of water, land, and air.	1. Reduce erosion and sedimentation from cropland, range, forest, and other lands.
	2. Sediment from 52 miles of streambanks in the Little Bitterroot and Blackfoot River drainages reduces water quality for many miles downstream.		2. Reduce streambank erosion.
	3. Sewage effluent and industrial wastes carry harmful chemicals and nutrients into streams and lakes.		3. Reduce discharge of sewage effluent and industrial pollutants.
	4. Runoff from agricultural, rural residential, and forested areas carries nutrients, pesticides, other harmful chemicals, and thermal pollution into streams and lakes.		4. Reduced chemical, nutrient, and thermal pollution from agricultural and forested lands.
	5. Air pollution from mineral smelters and forest products.		5. Reduced air pollution.

CHAPTER III--SUMMARY TABLE--PROBLEMS AND OBJECTIVES (Continued

		Specific Components of the Objectives	
Primary Objective	Problems (Public Concerns)	First Level (Desires)	Second Level (Preferences)
Environmental Quality (Continued)	6. Fluctuating water levels in reservoirs expose mudflats and barren shorelines.	Management and protection of areas of natural beauty and human enjoyment.	6. Reduced water fluctuations of reservoirs.
	7. Agricultural, residential, and road encroachment is destroying riparian vegetation along streams and lakeshores.		7. Protected riparian vegetation along streams and lakes.
	8. Insufficient access points to public lands and streams results in rutted trails, litter, and destruction of vegetation.		8. Additional access to public land.
	9. Visual aspects of natural open and green space have been disrupted.		9. Protected open and green space.
	10. Reservoirs have impounded several miles of previously free-flowing streams.		10. Free-flowing streams.
	11. Poorly designed roads and utility lines disrupt the natural beauty.		11. Planned road and utility line location and construction.

CHAPTER III--SUMMARY TABLE--PROBLEMS AND OBJECTIVES (Continued

Primary Objective	Problems (Public Concerns)	Specific Components of the Objectives	
		First Level (Desires)	Second Level (Preferences)
Environmental Quality (Continued)	12. Low flows in streams adversely affect aquatic resources.	Enhancement or preservation of biological resources.	12. Adequate minimum streamflows.
	13. Fluctuating water levels and sudden water temperature changes caused by releases from Hungry Horse Reservoir disrupts spawning and aquatic food production for 41 miles downstream.		13. Temperature control and reduced daily fluctuation of discharges from Hungry Horse Reservoir.
	14. Wildlife numbers are decreasing.		14. Adequate big game, upland, and wetland wildlife habitat.
	15. Instream structures, such as Bigfork diversion dam, are barriers to migration of fish.		15. Desirable fish migration.
	16. Archeological, historical, and cultural sites are not adequately protected and some are being destroyed.		16. Protected historical, archeological, and cultural sites.



MAP III-1

ECONOMIC STUDY AREAS

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

AUGUST 1976

10 0 10 20 30 40 50 MILES
SCALE 1:[illegible]

Source:
Base map prepared by SCS, Portland Cartographic Unit.
Thematic detail prepared by Montana State Staff.

U S DEPARTMENT OF AGRICULTURE

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SUBJECT TO CHANGE
M7-PL-23425-28

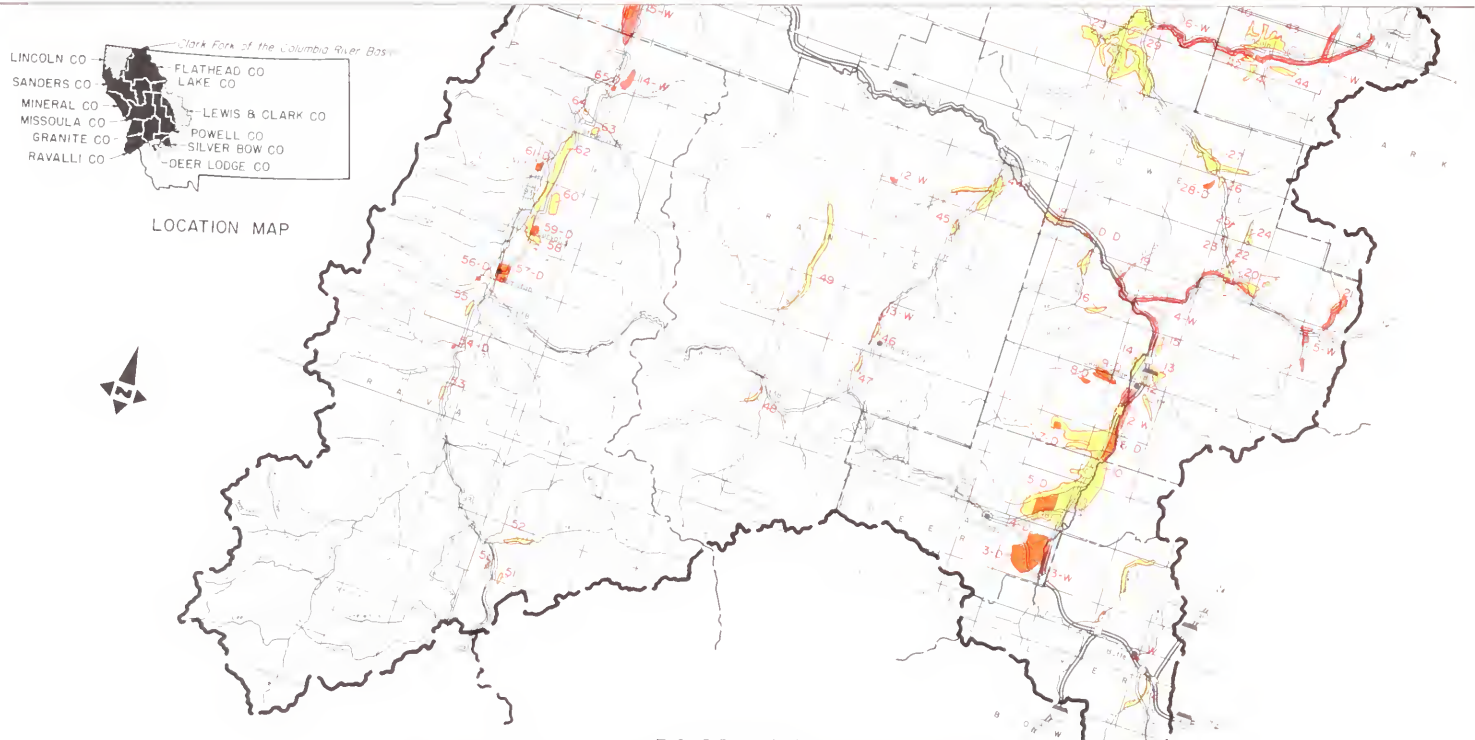

FIGURE III-I

WETLAND AND DRAINAGE INVENTORY
CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JUNE 1976

PRELIMINARY COPY
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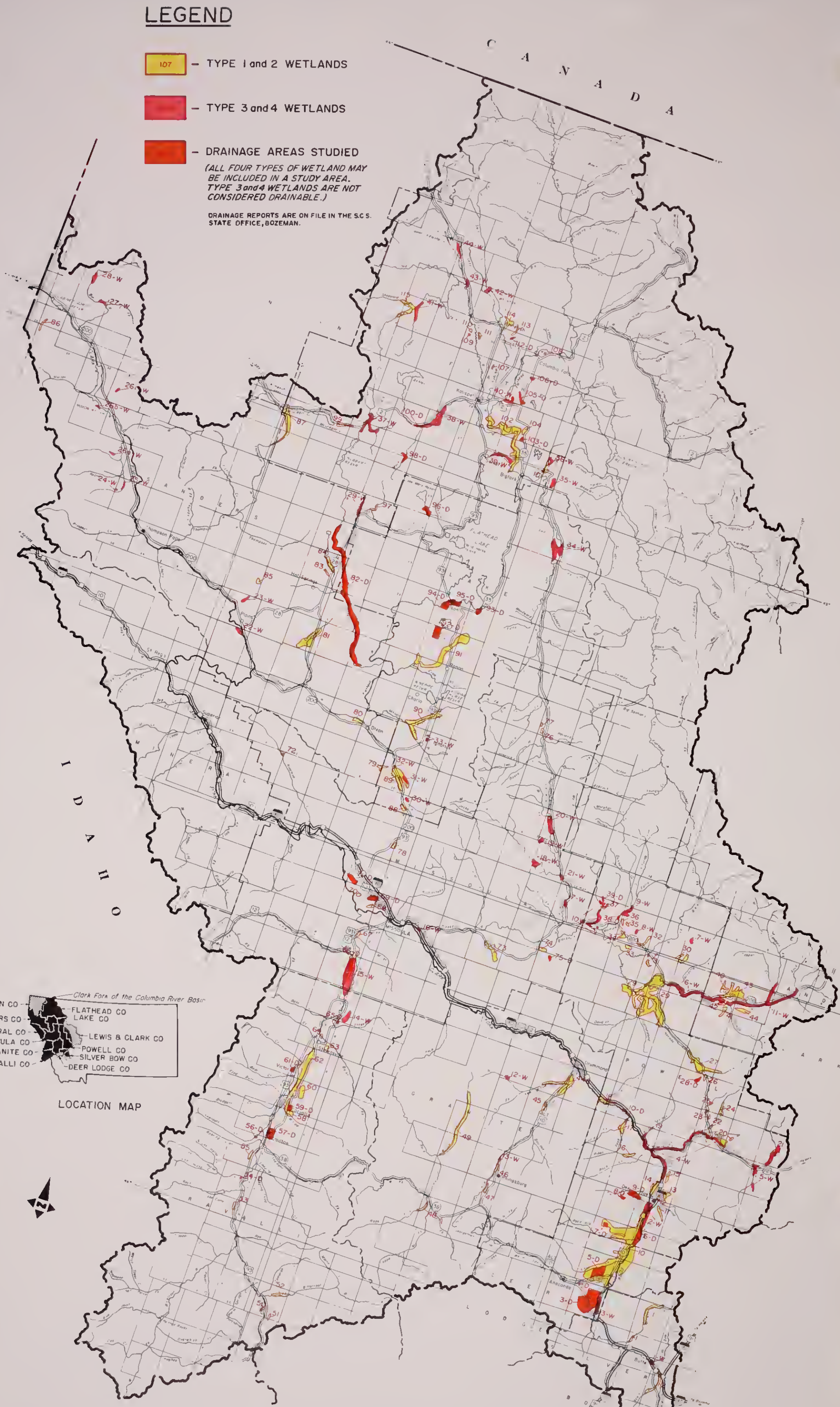


FIGURE III-1

WETLAND AND DRAINAGE INVENTORY
CLARK FORK OF THE COLUMBIA RIVER BASIN
MONTANA

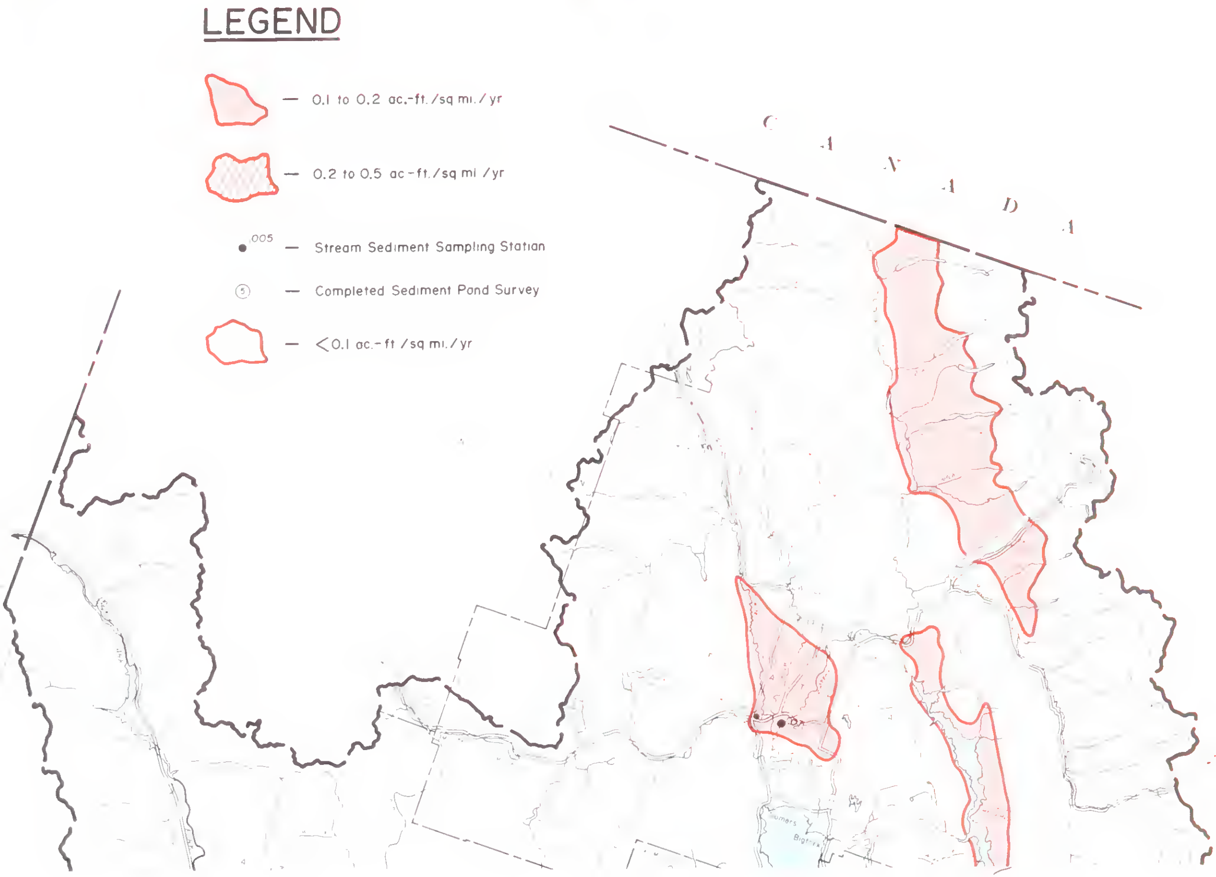
JUNE 1976

10 0 10 20 MILES
SCALE 1:1,000,000

PRELIMINARY COPY
SUBJECT TO CHANGE

U.S. DEPARTMENT OF AGRICULTURE

M7-SN-23425-2



LEGEND

▨ — 0.1 to 0.2 ac.-ft./sq mi./yr

▨ — 0.2 to 0.5 ac-ft./sq mi /yr

● .005 — Stream Sediment Sampling Station

⑤ — Completed Sediment Pond Survey

○ — <0.1 ac.-ft /sq mi./yr

MONTANA

JULY 1976

10 0 10 20 MILES

SCALE 1:1,000,000

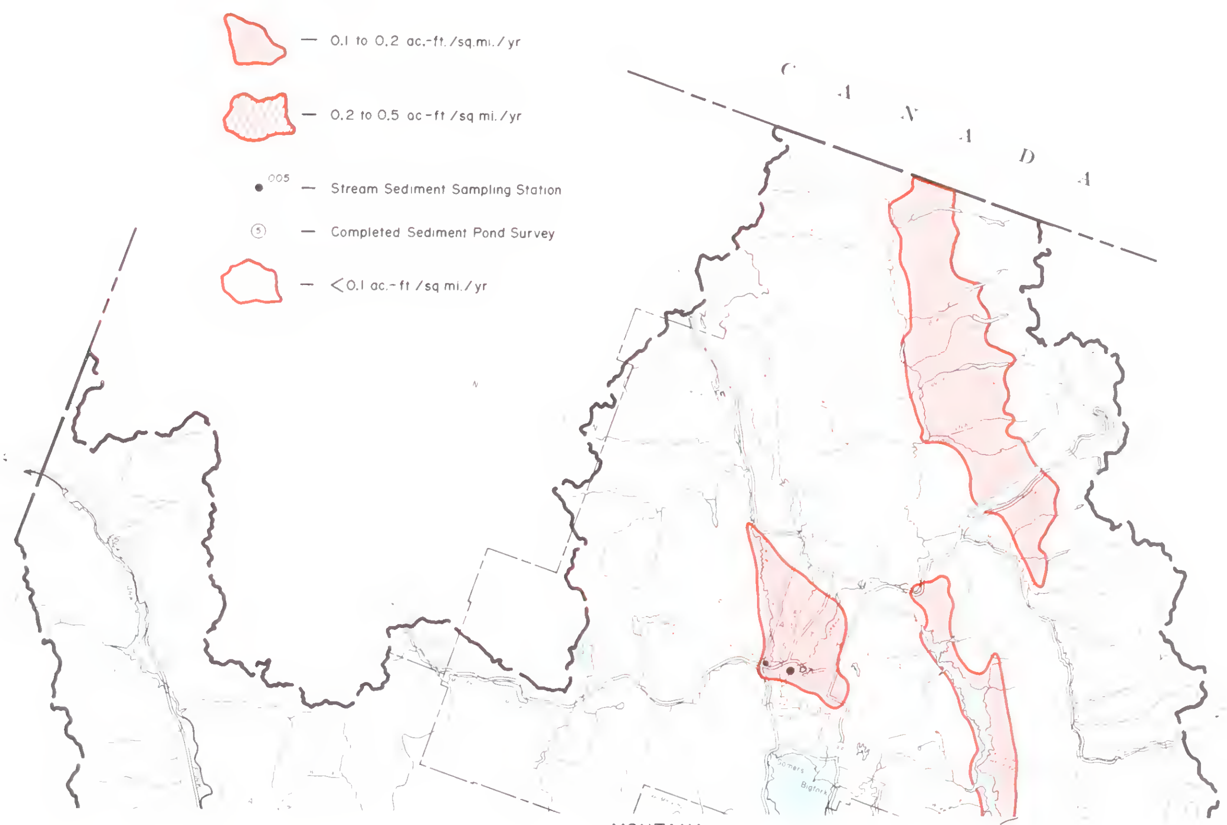
PRELIMINARY COPY
SUBJECT TO CHANGE

Source
Base map prepared by ... Portland Cartographic Unit.
Thematic detail prepared by Montana State Staff.

U.S. DEPARTMENT OF AGRICULTURE

SN-23425-2

LEGEND



🟥 — 0.1 to 0.2 ac.-ft./sq.mi./yr
▨ — 0.2 to 0.5 ac-ft/sq mi./yr
● 005 — Stream Sediment Sampling Station
⑤ — Completed Sediment Pond Survey
○ — <0.1 ac.-ft/sq mi./yr
CANADA
Somers
Bigfork

MONTANA

JULY 1976

10 0 10 20 MILES

SCALE 1 1,000,000

PRELIMINARY COPY
SUBJECT TO CHANGE

Base [illegible] pared [illegible] Cartographic Unit.
Thematic detail prepared [illegible] State Staff.

U.S. DEPARTMENT OF AGRICULTURE

SN-23425-2

LEGEND

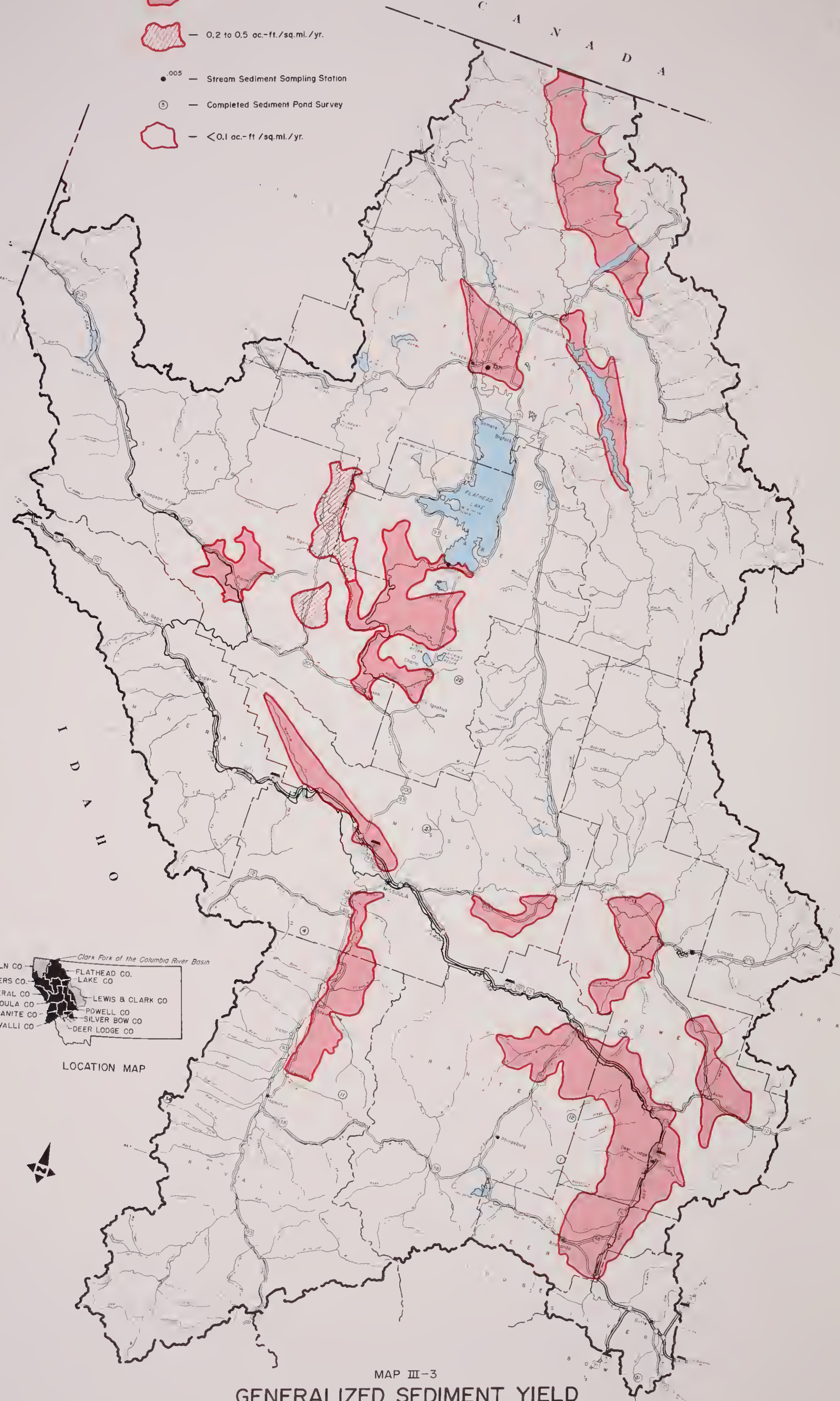
🟥 — 0.1 to 0.2 ac.-ft./sq.mi./yr

▨ — 0.2 to 0.5 ac.-ft./sq.mi./yr.

● .005 — Stream Sediment Sampling Station

⑤ — Completed Sediment Pond Survey

○ — <0.1 ac.-ft./sq.mi./yr.



MAP III-3

GENERALIZED SEDIMENT YIELD

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JULY 1976

10 0 10 20 MILES
SCALE 1:1,000,000

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Source:
Base map prepared by SCS, Portland Cartographic Unit
Thematic detail prepared by Montana State Staff.

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Out

CHAPTER IV--ECONOMIC PROJECTIONS AND ENVIRONMENTAL PREFERENCES

HISTORICAL DEVELOPMENT

Before the advent of white men into western Montana, the area was inhabited by three major tribes of Indians--the Kootenai, Pend d'Oreille, and the Flathead. Fur trading occurred within the Clark Fork drainage shortly after Lewis and Clark passed through the area and continued as a commercially important enterprise until the fur trade declined generally throughout the Northwest.

Some prospecting and mining has occurred in most regions of the drainage, but mineral extraction has predominated in the Upper Clark Fork. Gold was discovered on Gold Creek near Drummond in 1852. Both gold and silver were mined in the Butte area. Early prospectors finding copper ore considered it a nuisance as there was no domestic technology for refining at that time. By 1870 gold had dwindled, but silver in the oxidized state found in veins near the surface became commercially important when methods for its processing were developed.

When railroads reached Montana, copper ore from the Butte mines was shipped to ocean ports and then to Wales in the British Isles where metallurgical plants for copper reduction were in operation. By 1883 a copper reduction plant was built at the present site of Anaconda.

Following the trappers and prospectors, there appeared immigrants who were interested in making permanent settlements and who attempted to derive a livelihood from agriculture. The Bitterroot valley became the first permanently settled area in Montana in 1840. Permanent settlement for agriculture has been dated as early as 1860 in the Flathead valley. First settlement in Deer Lodge valley dates from 1855.

At first, agriculture developed slowly in the study area. When navigation of Flathead Lake and Flathead River became prevalent and the railroad arrived in the early 1890's, the agricultural economy matured rapidly. Creation of the Flathead Irrigation Project in the early 1900's gave impetus to agricultural growth in the northern part of the study area. Three irrigation districts are served by the project. The Camas, Mission, and Jocko Valley Districts serve land in Sanders, Lake, and Missoula Counties. The system consists of 15 storage reservoirs having a total approximate capacity of 148,700 acre-feet of storage water. There are approximately 1,300 miles of feeder and distribution canals in the irrigation system. Sprinkler irrigation started in the Flathead valley in 1947 and has continued to expand steadily since then.

Agricultural development was sporadic in the Bitterroot valley at first, with some small-scale irrigation works undertaken throughout the valley. Major John Owen came west with an Army contingent and remained upon his release. Owen purchased some property from the Jesuits and established a trading post. The establishment was known as Fort Owen and played a vital role in the history of western Montana for two decades. As early as 1854, Owen was diverting water for irrigation. He cultivated grain, forage, and vegetables, and established some of the first orchards in the study area.

Marcus Daly of Butte, after making a fortune in mining and copper silver refining, contributed to the development of Bitterroot valley by purchasing over 20,000 acres of land and developing a prosperous farm.

Daly is traditionally given credit for founding the town of Hamilton. He also developed an elaborate irrigation system whereby he brought much of his property under irrigation.

From the earliest days of settlement and mining in the study area, there developed a demand for forest products. The initial uses of logs were mine timbers, fuel, and domestic construction. With the advent of the railroads there was a huge demand for rail ties. However, with the large stands of coniferous timber in the area, lumber was soon being sawed for export.

Western Montana's early lumbering was by large mills because they alone had the efficiency to offset high freight costs to the Middle West and East. Following World War II, however, there was an influx of small mills which operated for a time. But the trend again is toward larger units.

In addition to approximately 120 mills, which saw and plane lumber, there are several wood product manufacturing firms operating within the study area. Plywood and veneer are produced by four mills. Louisiana-Pacific at Missoula, Champion International at Bonner, Plum Creek at Columbia Falls, and C & C Plywood Company at Kalispell are the major producers. Plum Creek Lumber Company at Columbia Falls produces fiberboard as a principal product, but the plant is also able to produce particleboard. Louisiana-Pacific at Missoula also produces particleboard.

In 1952 the Hoerner-Waldorf Corporation established a pulp mill near Missoula which permits utilization of sawmill residue, which earlier was merely waste material. In more recent years, when sawmill production has been restricted, Hoerner-Waldorf turned to round-wood for chips. Previously, sawmill residue was the only source of wood fiber.

Other recent benchmarks in the historical development of the study area include the construction of Kerr Dam on Flathead Lake in 1938 with a generating capacity of 180,000 kilowatts. Hungry Horse Dam, completed in 1953, is another hydroelectric plant which impounds 3,500,000 acre-feet of water and has a generating capacity of 285,000 kilowatts. Other smaller units include Noxon Rapids, Thompson Falls, Bonner, Bigfork, Big Creek, and Flint Creek.

In 1953 the Anaconda Aluminum Company began construction of an aluminum reduction plant at Columbia Falls in Flathead County. The plant commenced production in 1955.

ECONOMIC ACTIVITY INDICATORS

The Clark Fork of the Columbia River Basin in Montana is an area which is mostly mountainous and forested. It contains contrasting and beautiful landscapes which draw increasingly large numbers of tourists to the area, large acreages of natural and improved grassland and hayland for a thriving livestock industry, and minerals for important mining and smelting operations. In recent years about 73 percent of the total cropland harvested has been irrigated. In addition to the harvested cropland, there have been about 160,000 acres of irrigated pasture.

Agricultural sales in the basin in 1970 included $39,841,000 in livestock and livestock products and $11,500,500 in crops. Government payments added $2,461,000 for total farm receipts of $53,802,500.

Economic data needed for analyses are largely available on a county basis rather than a natural drainage basis. A county approach was used in defining economic boundaries in the "study area", including those counties whose major economic activity lies mostly in the basin area. The study area was then subdivided into three logical subareas similar to major drainage delineations (map III-1). The Flathead subarea includes Flathead and Lake Counties; the Lower Clark Fork subarea includes Missoula, Mineral, Sanders, and Ravalli Counties; and the Upper Clark Fork subarea includes Deer Lodge, Granite, Powell, and Silver Bow Counties. Economic data, unless otherwise stated, will pertain to these counties and these subareas.

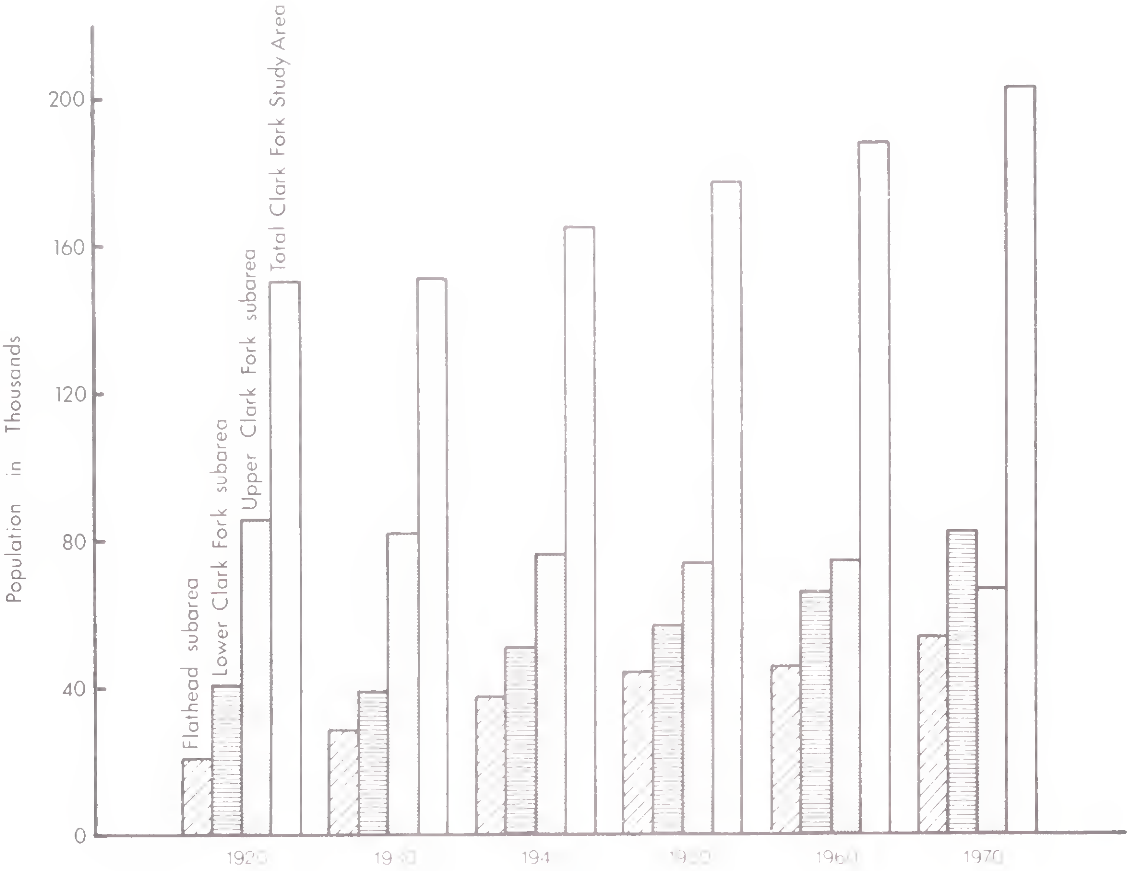
Population and Significant Population Characteristics

The 1970 population of the Clark Fork study area totaled 203,658 inhabitants (figure IV-1). This population amounted to 29 percent of the total state population.

There are no standard metropolitan statistical areas within the Clark Fork study area, nor are there cities classified as urbanized under the Bureau of Census definitions. The urban population in the study area consists of persons living in places of 2,500 inhabitants or more. The three largest cities are Missoula, 29,497; Butte, 23,368; and Kalispell, 10,526.

A problem associated with centers of population is the proliferation of subdivisions. Of the Montana counties where extensive subdivision occurs, three of the counties which top the list are in the study area.

FIGURE IV-1--TOTAL POPULATION, BY SUBAREA, 1920-1970
CLARK FORK OF THE COLUMBIA RIVER BASIN



US Census of Population

They are Flathead, Ravalli, and Missoula. These three counties, together with two others outside the drainage, account for over half the recorded subdivided acreage in the state.

The 50-year average annual growth rate has been roughly .7 of 1 percent, slightly higher than the state average for the same period, .5 of 1 percent, and considerably below the 50-year United States average of 1.9 percent. Between the decennial years 1930-1940 the average growth rate of the study area was an even 1.0 percent per year. In subsequent decennial periods the average annual growth rate equalled .7, .6, and .8 of 1 percent, respectively.

Population change has varied among the economic subareas of the Clark Fork. The most rapid and most consistent growth has occurred in the Flathead subarea. In two decennial periods, 1921-1930 and 1931-1940, the average annual growth rate was 2.8 percent. The slowest growth rate occurred during the 1951-1960 period, at only .2 of 1 percent annually. The 1961-1970 average growth rate was 1.6 percent, and the 50 year average annual growth rate for the Flathead subarea was 1.8 percent.

Population growth in the Lower Clark Fork subarea has roughly paralleled that of the Flathead. Except for a small decline during the 1921-1930 period, there has been a consistent growth during the past 50 years. The period of most rapid growth was 1931-1940, when average growth rate was 2.7 percent. The 50-year average for the Lower Clark Fork was 1.4 percent, and for the most recent decennial period, 1961-1970, it has been 2.2 percent.

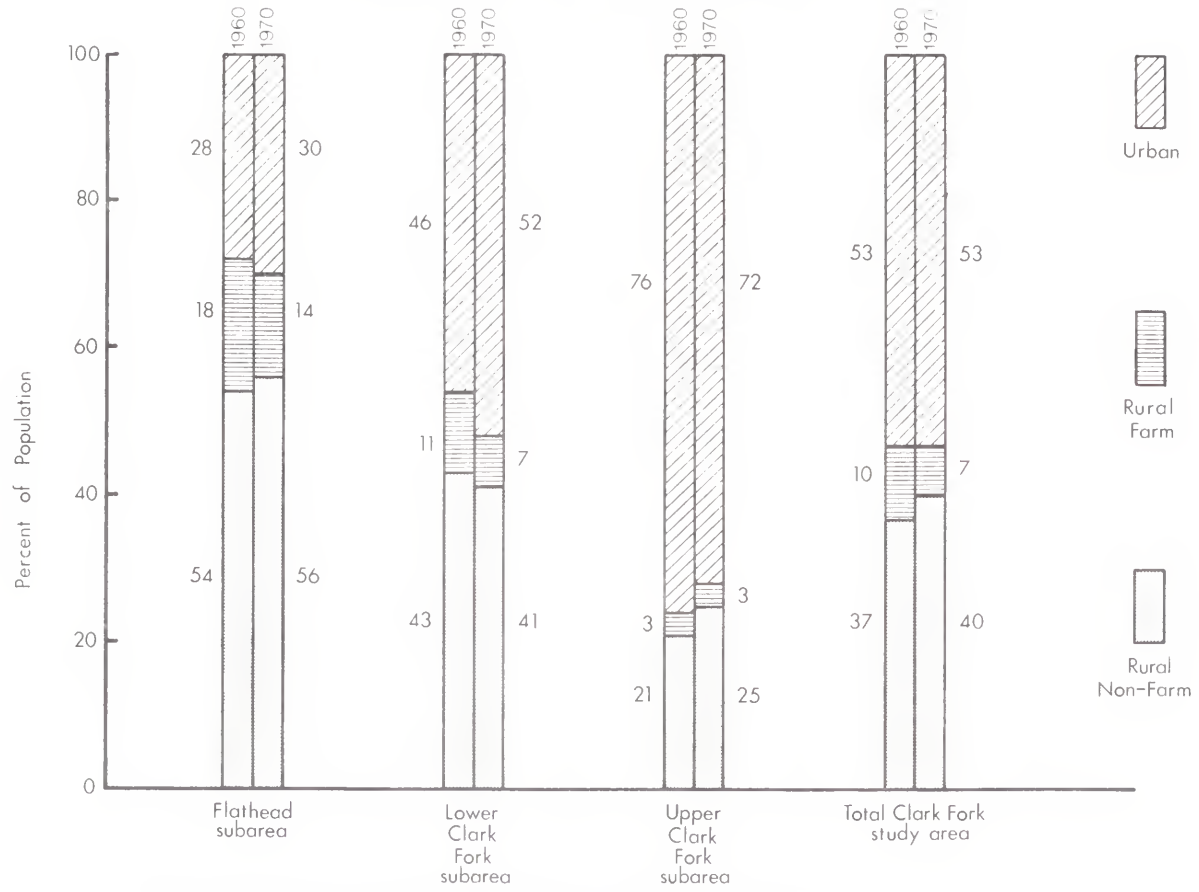
The Upper Clark Fork subarea has almost consistently declined in population during the past 50 years. With the exception of the period 1951-1960, when there occurred a small increase, the average annual decrease for decennial periods has ranged from .3 of 1 percent (1941-1950) to 1.0 percent for the most recent period, 1961-1970. The average annual decline for the 50-year period averaged .5 of 1 percent.

In 1970 about 47 percent of the total population of the study area was classified as rural and 53 percent urban, as defined by the Bureau of the Census. The [illegible] rural-urban ratio for the study area was the same as the present ratio, and it has not varied greatly since that time. There has occurred, however, a modest increase in the number of the rural nonfarm population (figure IV-2).

For the study area, the rural nonfarm population increased three percentage points from [illegible] to 1970. Both the Flathead and Upper Clark Fork have increased in this category, while the Lower Clark Fork declined slightly due largely to growth of and annexation to the city of Missoula.

Population densities for 1970 were computed from square miles included within the economic subareas. The Clark Fork study area is more densely populated than the State of Montana as a whole, but is still very sparsely populated. The Flathead subarea is the least populated, with 7.8 inhabitants per square mile in 1970 (figure IV-3). The Upper Clark Fork is the most densely populated of the three subareas, with 12.1 inhabitants per square mile. The Lower Clark Fork had a population density of 9.1 in 1970. The average density for the study area as a whole was 9.5 in 1970.

FIGURE IV-2--RURAL FARM, RURAL NON-FARM, AND URBAN POPULATION, BY SUBAREA, 1960 and 1970
CLARK FORK OF THE COLUMBIA RIVER BASIN



U.S. Census of Population

The Flathead subarea has a larger percentage of its population under age 15 than either the state, the average for the Clark Fork study area, or the other subareas. Various factors play a part in this rather unique age distribution in the Flathead. The aluminum plant at Columbia Falls attracts employees who have younger families. Also, the Indian reservation contains larger families than is average in the study area. The Upper Clark Fork subarea has a proportionately higher share of its inhabitants in the age group 40-64, and the Lower Clark Fork has considerably more persons between the ages of 15 and 39 than the state or other subareas. The University of Montana at Missoula obviously has an impact on this age group.

Social Structure and Institutional Arrangements

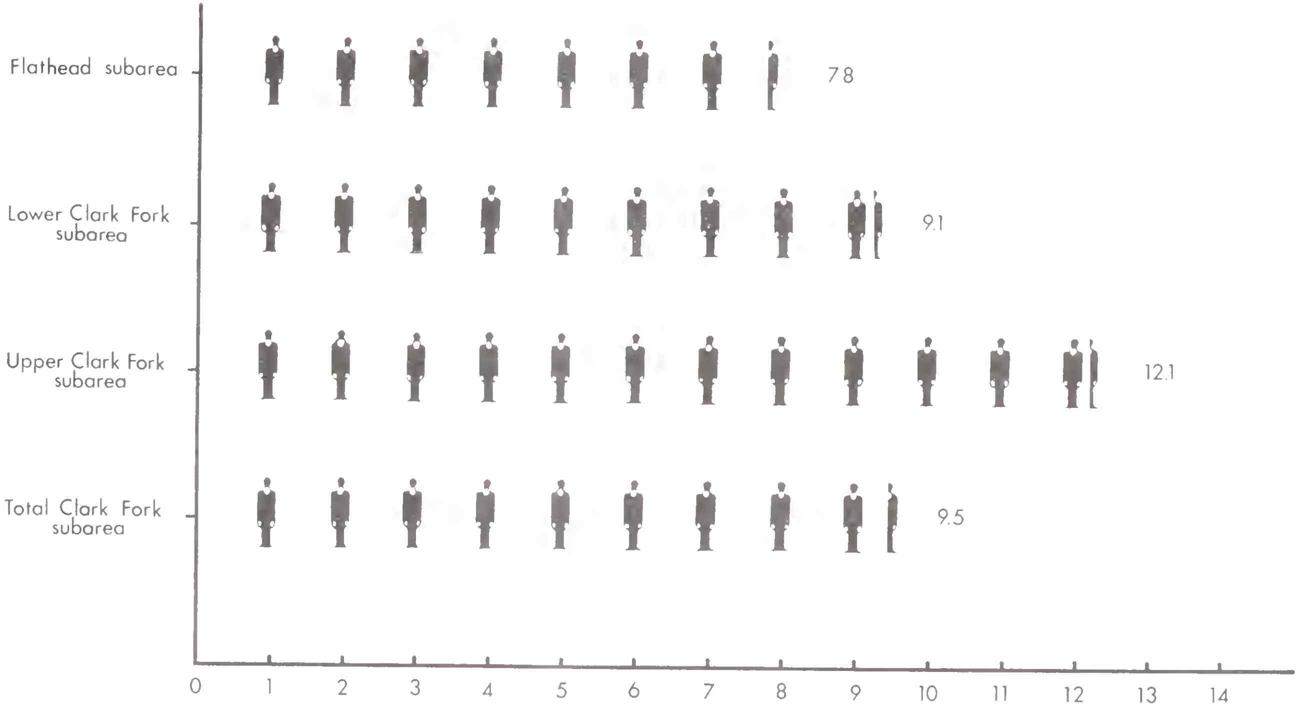
With the population of white settlers in western Montana expanding rapidly, the white civil authorities acted to acquire what was generally recognized as Indian lands by establishing a single reservation for the three main tribes. Such action would permit white settlers to move in and establish homesteads under existing land settlement laws.

The ancestral home of the Flathead Indians was the Bitterroot valley. The Pend d'Oreille ranged along the Flathead and Clark Fork Rivers down to Lake Pend Oreille. The Kootenai hunted and fished around Flathead Lake. The St. Ignatius Mission had been established in the south end of the Flathead valley in 1851.

In 1871, President Grant had a survey made which he said demonstrated that the Bitterroot valley was not better adapted to the needs of the Indians than the Flathead Reservation. The Indians were moved to the

FIGURE IV-3--POPULATION DENSITY PER SQUARE MILE, BY SUBAREA, 1970

CLARK FORK OF THE COLUMBIA RIVER BASIN



Computed from data in Census of Population and Montana Data Book

Flathead Reservation. The lands in the Bitterroot were surveyed and opened to settlement to the whites upon the payment of $1.25 an acre to the federal government. The homestead and preemption laws did not apply. Many squatters had already moved in and occupied some of the choice lands. A remnant of the Flathead tribe remained in the Bitterroot for a total of 35 years after the Flathead Reservation was formed and before a settlement was finally reached which forced the remainder of the tribe onto the reservation.

The Flathead Reservation, however, was not to remain under Indian ownership and control. In 1887 Congress passed the Dawes Act that would open the lands of the Flathead Indian Reservation to white settlement. Theoretically, the best of the lands was to be allocated to the Indians with the surplus lands to be sold to homesteaders. Some allotments were made to Indians and the remainder of the reservation lands was open to white settlement.

In terms of the social structure of the study area, the Indians exert the greatest influence in the Flathead subarea. The native Americans account for about five percent of the total population in the Flathead, 1.5 percent in the Lower Clark Fork, and 1.1 percent in the Upper Clark Fork. Other non-Caucasian groups account for less than one percent in all three of the subareas of the study area.

While eastern Montana, both historically and economically, is related to the Great Plains, western Montana, due to similarities in geographic characteristics, resources, and economic activity, has had close ties with the states lying to the west and has been integrated as part of the Pacific Northwest.

That portion of Montana lying within the bounds of the study area was at various times under the Oregon, Washington, and Idaho territories successively. After existing under these governmental jurisdictions for several decades, Montana was admitted to the Union in 1889. Under the Montana Constitution, incorporated cities in Montana are permitted to choose from among three optional forms of government--the Commission, Alderman, and Commission-Manager. Counties have various options for government, but all have chosen the Commission form of administration.

From the earliest settlements, education has taken a high priority in the social order and Montana's public elementary and secondary school system has made great strides. In addition to the elementary and secondary schools of the study area, the University of Montana at Missoula, Montana College of Mineral Science and Technology at Butte, and Flathead Valley Community College at Kalispell have significant impacts on the area--both economically and socially. The University of Montana Biological Research Station at Yellow Bay on Flathead Lake is widely recognized for its research. Another institution of economic and social significance is the Rocky Mountain Laboratory, which is located near Hamilton. It was here the causes of Rocky Mountain Spotted Fever were discovered and a vaccine for its prevention developed.

Major Types of Economic Activity and Employment

An indicator of major importance--employment data--reflects the major economic forces prevalent in the study area. These historic and current data serve a dual function. They outline the sectors which, in the past, have shown expansion or decline, and also provide the base and framework upon which employment projections may be made for inclusion in a subsequent section of this report. Two major sources of employment data for the study area are available, the Decennial Census and the Montana State Employment Security Division. Although both sources are utilized in the conduct of this study, the data in the following employment series--for the study area and its subareas--are based on Decennial Census data.

Employment trends generally parallel population. The employment participation rate (Employment/Population) for the study area is approximately the same as for the state, 34.0 and 35.2 percent, respectively, in 1970. This rate tends to be fairly uniform throughout the subareas of the Clark Fork, but the Flathead subarea does have a slightly lower participation rate than the Lower and Upper Clark Fork subareas, with 31.1 percent for Flathead, and 35.5 and 34.2 percent for Lower and Upper Clark Fork, respectively.

Employment in the study area totaled 69,322 in 1970 according to the Decennial Census. This was 28 percent of the total state employment. Since 1940, total employment for the study area has expanded at an average annual rate of .7 of 1 percent, increasing from 54,334 in 1940 to 69,322 in 1970 (table IV-1). Employment in the Flathead subarea and the Lower Clark Fork subarea has increased at a more rapid rate than population (tables IV-2 and IV-3). In the Upper Clark Fork, employment has declined at about the same rate as population (table IV-4).

Agricultural employment in the study area has conformed to the national and state trends. Farm consolidation and enlargement and increasing mechanization have resulted in a decrease in agricultural

TABLE IV-1--POPULATION, PARTICIPATION RATE, AND EMPLOYMENT, BY INDUSTRY, 1940-1970

CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	1940	1950	1960	1970
	Number			
Population	165,225	177,037	188,060	203,658
Participation rate (employment/population)	32.9	35.8	33.2	34.0
Total employment	54,334	63,353	62,449	69,322
Employment by industry:				
Agriculture, forestry, & fishery	9,667	8,841	6,267	5,524
Mining	8,464	6,484	4,064	3,419
Contract construction	2,515	4,222	3,387	3,921
Food & kindred products manufacturing	861	1,045	1,083	502
Lumber & wood products manufacturing	2,306	3,262	4,153	4,732
Printing & publishing	535	629	781	665
Chemicals & allied products manufacturing	36	65	254	282
Primary metals & fabricated metals	2,042	3,355	3,250	2,948
Machinery manufacturing	140	137	169	197
All other manufacturing	284	325	542	1,201
Transportation, communications, & public utilities	4,636	6,525	5,874	5,550
Wholesale & retail trade	8,946	12,013	12,560	14,891
Finance, insurance, & real estate	994	1,346	1,912	2,418
Lodging & personal services	2,197	2,441	2,130	2,703
Business & repair service	1,037	1,663	1,220	1,412
Entertainment & recreational services	531	621	504	524
Private households	1,187	919	1,453	851
Medical, educational, & others	4,131	6,079	8,830	14,571
Public Administration	3,006	2,256	2,913	3,011
Industry not reported	819	1,125	1,103	--

U.S. Census of Population.

TABLE IV-2--POPULATION, PARTICIPATION RATE, AND EMPLOYMENT, BY INDUSTRY, FLATHEAD SUBAREA, 1940-197

CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	1940	1950	1960	1970
	Number			
Population	37,761	45,330	46,069	53,905
Participation rate (employment/population)	28.8	32.6	31.2	31.1
Total employment	10,877	14,817	14,376	16,785
Employment by industry:				
Agriculture, forestry, & fishery	3,803	3,372	2,199	1,733
Mining	100	30	18	22
Contract construction	706	1,717	678	1,151
Food & kindred products manufacturing	126	167	186	71
Lumber & wood products manufacturing	972	1,149	1,375	1,822
Printing & publishing	67	115	184	114
Chemicals & allied products manufacturing	1	7	--	41
Primary metals & fabricated metals	9	20	583	977
Machinery manufacturing	18	24	41	71
All other manufacturing	53	67	111	278
Transportation, communications, & public utilities	974	1,788	1,326	1,320
Wholesale & retail trade	1,657	2,654	3,215	3,774
Finance, insurance, & real estate	137	264	413	562
Lodging & personal services	351	465	517	702
Business & repair service	253	495	316	378
Entertainment & recreational services	90	129	111	118
Private households	270	242	425	170
Medical, educational, & others	772	1,132	1,743	2,631
Public Administration	369	526	726	850
Industry not reported	149	454	209	--

U.S. Census of Population.

TABLE IV-3--POPULATION, PARTICIPATION RATE, AND EMPLOYMENT, BY INDUSTRY, LOWER CLARK FORK SUBAREA, 1940-1970
CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	1940	1950	1960	1970
	Number			
Population	51,077	57,658	66,921	82,723
Participation rate (employment/population)	33.7	35.8	34.7	35.5
Total employment	17,220	20,654	23,248	29,426
Employment by industry:				
Agriculture, forestry, & fishery	4,395	4,126	2,997	2,726
Mining	217	73	61	50
Contract construction	1,137	1,450	1,626	1,723
Food & kindred products manufacturing	352	445	515	257
Lumber & wood products manufacturing	1,150	1,943	2,566	2,505
Printing & publishing	163	202	284	267
Chemicals & allied products manufacturing	5	16	3	18
Primary metals & fabricated metals	19	28	52	47
Machinery manufacturing	25	28	56	72
All other manufacturing	87	95	323	786
Transportation, communications, & public utilities	1,470	2,076	2,216	2,326
Wholesale & retail trade	2,872	3,933	4,513	6,644
Finance, insurance, & real estate	349	452	819	1,118
Lodging & personal services	728	922	873	1,209
Business & repair service	370	620	503	718
Entertainment & recreational services	134	241	171	276
Private households	438	348	549	377
Medical, educational, & others	1,410	2,507	3,759	7,328
Public administration	1,726	755	1,012	979
Industry not reported	173	394	350	--

U.S. Census of Population.

TABLE IV-4--POPULATION, PARTICIPATION RATE, AND EMPLOYMENT, BY INDUSTRY, UPPER CLARK FORK SUBAREA, 1940-1970 CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	1940	1950	1960	1970
	Number			
Population	76,387	74,049	75,070	67,030
Participation rate (employment/population)	34.3	37.6	32.9	34.4
Total employment	26,237	27,882	24,825	23,111
Employment by industry:				
Agriculture, forestry, & fishery	1,469	1,343	1,071	1,065
Mining	8,147	6,381	3,985	3,347
Contract construction	672	1,055	1,083	1,047
Food & kindred products manufacturing	383	433	382	174
Lumber & wood products manufacturing	184	170	212	405
Printing & publishing	305	312	313	284
Chemicals & allied products manufacturing	30	42	251	223
Primary metals & fabricated metals	2,014	3,307	2,615	1,924
Machinery manufacturing	97	85	72	54
All other manufacturing	144	163	108	137
Transportation, communications, & public utilities	2,192	2,661	2,332	1,904
Wholesale & retail trade	4,417	5,426	4,832	4,473
Finance, insurance, & real estate	508	630	680	738
Lodging & personal services	1,118	1,054	740	792
Business & repair service	414	548	401	316
Entertainment & recreational services	307	251	222	130
Private households	479	329	479	304
Medical, educational, & others	1,949	2,440	3,328	4,612
Public administration	911	975	1,175	1,182
Industry not reported	497	277	544	--

U.S. Census of Population.

employment--both in absolute numbers and in percentage of total employment. Part-time farming is prevalent, with many farmers maintaining their farm residences but commuting to a nearby town or city for employment at least part of the year. See table IV-5.

Mining and primary metal industry combined as one unit was the largest basic industry employer in the basin in 1970. Mining employment is concentrated in the Upper Clark Fork subarea where the open-pit copper mining operation is one of the primary economic activities. Employment in mining has declined significantly since 1940. Average annual decline in the 1941-1950 decennial period was 2.4 percent and the decline in the 1951-1960 period was even greater--3.4 percent. Employment in mining leveled off somewhat during the past 10 years, with an average annual decline of only 1.7 percent. The decline in the number of persons employed in mining reflects the technological advances in the industry during the past two decades, which have significantly increased output per man-hour. Most of the mining activity of the subarea has been copper mining, although a nominal number of employees is engaged in mining of phosphate in Granite and Powell Counties. Some gold, silver, and sapphires are mined on a small scale. Sand and gravel are mined to meet construction needs.

Although construction employment has shown considerable stability during the last decade, the industry was highly volatile during the 1941-1960 period. Although the tables do not show annual data, employment in the construction industry has shown noticeable change within decennial periods which reflect changing economic trends within the study area.

TABLE IV-5--OFF-FARM EMPLOYMENT BY FARM OPERATORS, BY SUBAREA, 1969

CLARK FORK OF THE COLUMBIA RIVER BASIN

	Operators employed off-farm 100 or more days		Operators employed off-farm 200 or more days	
	Number	Percent of all farms	Number	Percent of all farms
Flathead	416	50.4	313	37.9
Lake	395	39.0	308	30.4
FLATHEAD SUBAREA	811	44.1	621	33.8
Missoula	158	48.3	124	37.9
Mineral	28	60.9	26	56.5
Sanders	195	51.9	158	42.0
Ravalli	391	45.5	304	35.3
LOWER CLARK FORK SUBAREA	772	48.0	612	38.0
Deer Lodge	33	49.3	32	47.8
Granite	28	20.0	18	12.9
Powell	42	24.9	31	18.3
Silver Bow	56	51.9	51	47.2
UPPER CLARK FORK SUBAREA	159	32.9	132	27.3
TOTAL STUDY AREA	1,742	44.3	1,365	34.7

U.S. Census of Agriculture.

Government employment, by all three levels of government, totaled 14,673 or 21.2 percent of all employees in 1970 (table IV-6).

TABLE IV-6--EMPLOYMENT BY GOVERNMENTS BY SUBAREAS--1970
CLARK FORK OF THE COLUMBIA RIVER BASIN

County and Subarea	Federal	State (estimated)	Local	Total
	- - - - - - - - number of employees			- - - - - - -
Flathead	493	282	1,167	1,942
Lake	205	181	467	853
FLATHEAD SUBAREA	698	463	1,634	2,795
Mineral	57	57	218	332
Missoula	1,117	2,697	1,404	5,218
Ravalli	407	293	415	1,115
Sanders	129	106	319	554
LOWER CLARK FORK SUBAREA	1,710	3,153	2,356	7,219
Deer Lodge	101	1,071	322	1,494
Granite	26	83	91	200
Powell	11	406	243	660
Silver Bow	363	824	1,118	2,305
UPPER CLARK FORK SUBAREA	501	2,384	1,774	4,659
TOTAL STUDY AREA	2,909	6,000	5,764	14,673

Source: U. S. Census of Population

Property tax is the principal source of governmental funding within the study area. Counties, municipalities, and school districts depend almost entirely upon this tax. There is no general sales tax for support of county or city government, although state government derives some revenues from selective sales taxes. Individual income and corporate taxes also support state government.

Employment in the manufacturing industries in 1970 comprised 1[illegible] percent of total employment for the study area. The durable goods industries were dominant, with lumber and wood products and primary metals manufacturing being the primary employers. Although employment in primary metals declined somewhat during the past decade, there occurred some expansion in the lumber and wood products sector, resulting in a net increase for the durable goods industries as a group.

Food and kindred products manufacturing sector has been the second largest employer for the nondurable goods industries following paper manufacturing until recently when sugar beet processing was discontinued in the study area. In 19[illegible], printing and publishing employed more people. Employment trends in transportation and utilities within the study area follow closely the state trend for these industries. Employment increased through the period 1940-1960 and then declined slightly in the decennial period 1961-1970. Employment in the transportation sector has increased during the latter part of the last decade. Even employment on the railways has increased in western Montana, while decline has been the trend in most areas of the nation. Communications and public utilities have generally enjoyed significant productivity increases per employee which has dampened employment expansion in those industries.

Growth in trade employment within the study area has been persistent throughout the 30-year period, 1941-1970. Growth was greatly accelerated in the 1940-1950 period, averaging three percent annually. The growth rate slowed in the following decade to only .4 of 1 percent annually, then accelerated again to 1.7 percent between 1960 and 1970. Expansion of the trade sector, state-wide has exceeded growth within the Clark

Fork study area, but only by a small margin. The 30-year average annual growth rate for the state was 2.0 percent and 1.7 percent for the study area.

Employment in the finance, insurance, and real estate sector has been characterized by extraordinary expansion. The growth rate over a 20-year period in the study area averaged three percent annually, and far exceeded the growth in total employment for the same period. This rapid expansion in the finance sector has been state-wide, with the rate of growth state-wide exceeding that of the study area by a small margin.

Employment in most of the service categories has shown modest expansion, except for employment in private households and medical and educational institutions. These two sectors are widely divergent in their changing roles. Private household employment has historically been low in the study area and only slightly more significant state-wide. Employment in private households declined both in the study area and state-wide during the past decade. Medical and educational services employment has expanded rapidly and persistently. Net increases occurred during every decennial period since 1930. The average annual increase for medical and educational services in the study area has been 4.3 percent for the past 30 years, and 5.1 percent for the past 10 years.

Personal Income

Measurements of personal income are highly sensitive indicators of economic and business conditions in a regional economy. Total personal income is payment received in aggregate by individuals--both as payment for factor services, including labor, and as transfer payments from government and business, but not from individuals. Personal income may be measured either at the point at which income payments are made, or by considering total personal expenditures plus savings. However, this social account is somewhat more inclusive than mere income payments to individuals in that personal income includes an estimate of the imputed value of rents on owner-occupied dwellings. Also, nonprofit organizations and private trusts, pension, health, and welfare funds are treated as persons in computing the personal income account.

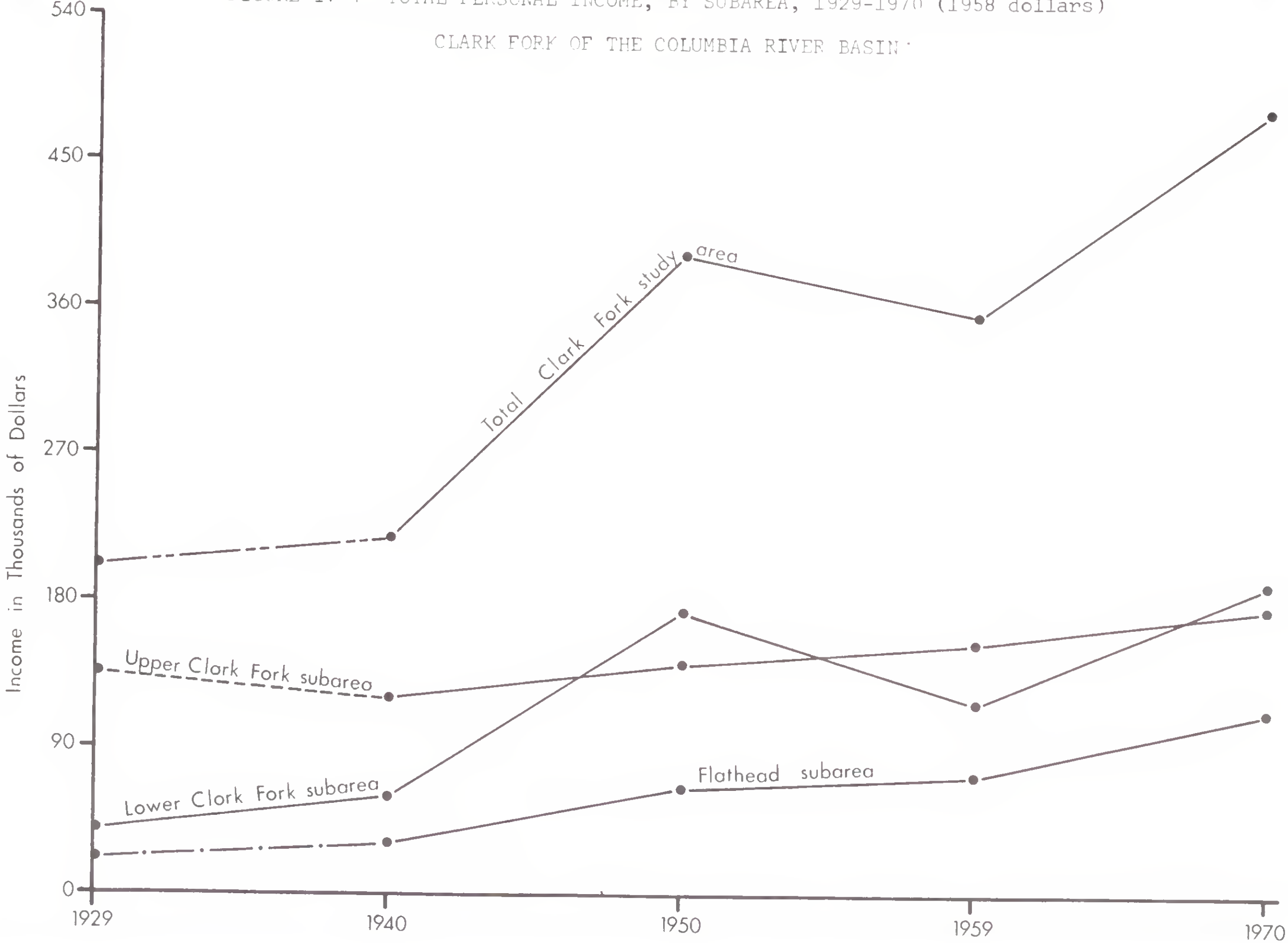
Figure IV-[illegible] presents total personal income for a historical series, selected years 1929 through 1970 for the Clark Fork study area and three economic subareas. These data have been adjusted to constant 1958 dollars to eliminate purely inflationary advances in the personal income account. Although a 50-year series is presented, the more recent data, last 10 to 20 years, warrant particular attention.

The period 1950-1958 was characterized by a decline in real personal income for the study area as a whole. The decline averaged one percent per year for the period. Although both the Flathead and Upper Clark Fork subareas had modest increases in real personal income, an average annual decline of 3.5 percent for the Lower Clark Fork was a dominant force on total real personal income.

The period 1959-1970 witnessed a reversal of the declining trend in the Lower Clark Fork, and all subareas experienced growth in real personal income. Expansion of personal income in the Flathead and

FIGURE IV-4--TOTAL PERSONAL INCOME, BY SUBAREA, 1929-1970 (1958 dollars)

CLARK FORK OF THE COLUMBIA RIVER BASIN



U.S. Dept of Commerce – Regional Economics Information System

Lower Clark Fork subareas was vigorous for the 12-year period. Average annual increase for the two subareas was 3.3 and 4.1 percent, respectively. Increase in the Upper Clark Fork was modest, averaging 1.3 percent annually for the 12-year period. Growth rate for the study area as a whole during the 1959-1970 period averaged 2.9 percent annually, identical to that experienced by the state for the same period.

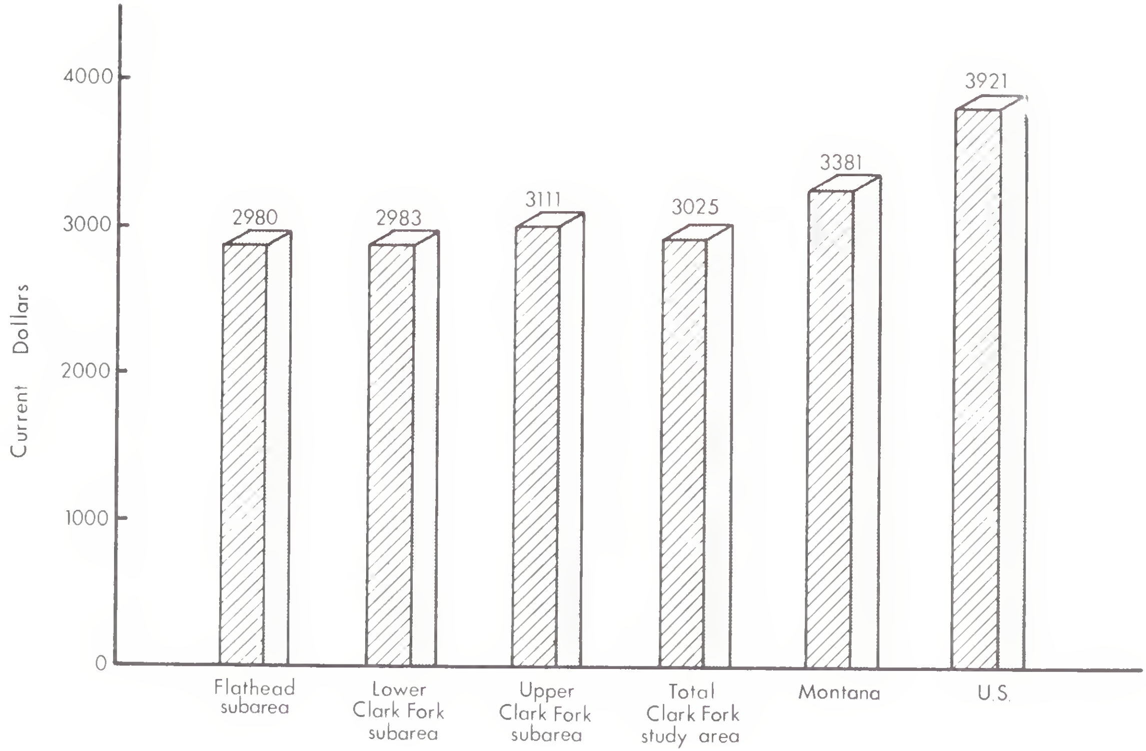
Per capita personal income (total income divided by total population) is generally considered to be a more meaningful indication of the relative economic well-being of individuals within a region than estimates of total personal income. For the study area as a whole, per capita income in 1970 was $3,325, about 10 percent below the state per capita income. The study area was also considerably below the national 1970 per capita income of $3,921. Figure IV-5 compares the per capita personal incomes of the economic subarea of the Clark Fork.

Mean family income for the study area in the base period was $9,474. Ten percent of the total number of families had incomes below the poverty threshhold established by the Federal Interagency Committee on Poverty. Mean family income was $8,821, $10,048, and $9,233 for the Flathead, Lower Clark Fork, and Upper Clark Fork subareas, respectively. The Flathead subarea had 12 percent of all families below the poverty level, while the Upper Clark Fork had 9 percent, and the Lower Clark Fork subarea had 10 percent.

The major components of personal income are earnings, property income, and transfer payments, the latter being payments such as unemployment insurance, social security, and general welfare payments.

FIGURE IV-5--TOTAL PER CAPITA INCOME, BY SUBAREA, WITH COMPARISON WITH STATE AND NATIONAL, 1970

CLARK FORK OF THE COLUMBIA RIVER BASIN



Computed from Population and Personal Income data

A deduction must be made for social security premiums paid. Earned income is derived from wages, salaries, profits, or fees as opposed to income derived from rents, dividends, interest, etc. Roughly, the distinction is one between income derived from labor or entrepreneurship and income derived from invested capital.

Measured in current dollars, personal income in the Clark Fork study area totaled $628 million in 1970 (table IV-7). Transfer payments constituted about 12 percent of total income. The proportion contributed to total personal income by transfer payments was generally uniform among the subareas of the study area. Wages and salaries comprised nearly 84 percent of total earnings in the study area as a whole. This component did not vary significantly among the subareas, except in the Flathead subarea, where wages and salaries totaled [illegible] percent of total earnings. Proprietors' income comprised a greater proportion of total earnings--15 percent--in the Flathead than in the Lower and Upper Clark Fork subareas.

Transportation and Warehousing

Trucking transportation services are excellent throughout the state and throughout the Clark Fork study area. Total revenues for trucking services were $96,185,000 for the State of Montana and [illegible] for the Clark Fork study area in 1970. As reflected in the revenue estimates, trucks provide fast, flexible, and efficient means of moving goods both within the Clark Fork study area and throughout the state.

Four major airlines operate in the state of Montana and three in the Clark Fork study area. Revenues for the state were $6,770,000

TABLE IV-7--PERSONAL INCOME, BY MAJOR COMPONENTS, BY SUBAREA--1970 CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Flathead Subarea	Lower Clark Fork Subarea	Upper Clark Fork Subarea	Total Clark Fork Study Area
	- - - - - - - - - - - - 1,000 current dollars - - - - - - - - - - - -			
TOTAL PERSONAL INCOME	151,630	251,686	225,208	628,524
Earnings	113,885	191,023	167,655	472,563
Property income	24,685	42,915	37,260	104,860
Transfer payments	19,906	28,290	29,293	77,489
Less Social Security premiums	-6,846	-10,542	-9,000	-26,388
TOTAL EARNINGS	113,885	191,023	167,655	472,563
Wages and salaries	90,319	161,752	143,468	395,539
Other labor income	6,501	9,032	7,688	23,221
Proprietors' income	17,065	20,239	16,499	53,803
AGRICULTURAL INCOME				
Total cash receipts	23,077	17,723	13,003	53,803
FOREST PRODUCTS INDUSTRY				
Wholesale value of products	66,000	124,000	10,000	200,000

Source: U. S. Department of Commerce--Regional Economics Information System and Montana Agricultural Statistics and within the study area, $1,828,000. These revenues represented 10.6 million ton miles of service for the state and 2.8 million ton miles within the study area.

Revenues earned by railroads within the state in 1970 totaled $164,955,000 and within the study area, $48,496,000. Total tons of freight moved within the state totaled 38.7 million and within the study area, 11.4. Major commodities transported by rail include farm products, food and kindred manufactured products, lumber and wood products, and primary metal products.

Revenues from all other transportation and warehousing categories totaled $22,610,000 for the state in 1970 and $6,240,000 for the Clark Fork study area. This category includes local, suburban, and highway passenger, pipeline transportation, and transportation services which include carrier affiliates.

This basin has a transportation disadvantage because of freight rate structures and distances to major market areas.

PRESENT ECONOMIC SITUATION

Agricultural and Related Economic Activity

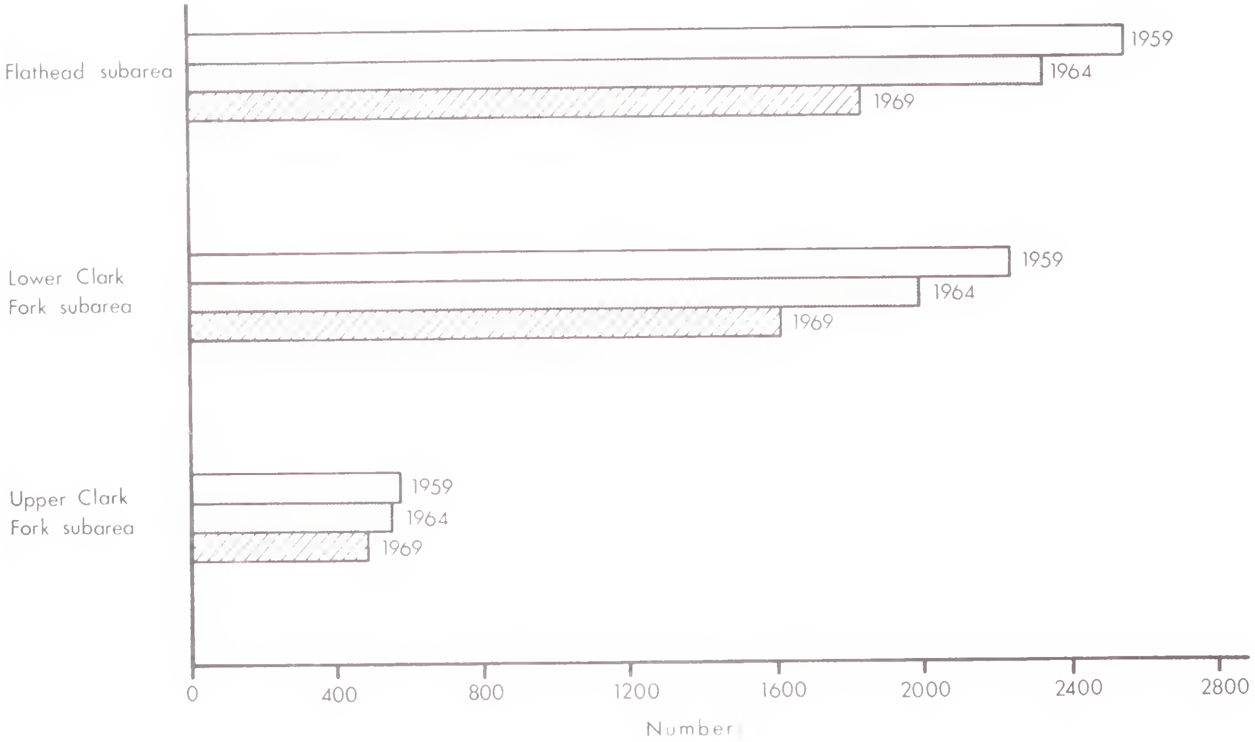
Agriculture is one of the study area's leading industries. Livestock and livestock products are the principal sources of agricultural income, but field crops are important, particularly in the Flathead and Bitterroot valleys. Pasture and rangelands are extensive throughout the study area. A major factor has been the consolidation of farms into larger and more economical units. Farm numbers have declined more rapidly in the Clark Fork study area than in the state as a whole. Farm numbers declined 27 percent in the study area between 1959 and 1969. The rate of decline for the state was 25 percent for the same time period. Farm numbers have declined more rapidly in the Lower Clark Fork and Flathead subareas than in the Upper Clark Fork (figure IV-6). The number of farms in the Clark Fork study area was 3,930 in 1969. Of this total, 1,837, or 47 percent, were in the Flathead subarea; 1,609, or 41 percent, in the Lower Clark Fork; and 484, or 12 percent, in the Upper Clark Fork.

Attendant to the trend in declining farm numbers is an increase in the average size of farms and ranches. In the decade 1959-1969, the average farm size for the study area has increased 32 percent. The trend to larger size farms is more rapid within the study area than for the state as a whole. The increase for the state was only 14 percent. Within the subareas of the study area, farm size has increased more rapidly in the Lower Clark Fork in the 1959-1969 time period, with a 36 percent increase. The Flathead and Upper Clark Fork subareas had increases in average farm size of 30 and 17 percent, respectively. Farms are smaller and more intensively cropped in the Flathead subarea. Farms in the Lower Clark Fork are considerably larger than those in the Flathead, and the average size farms within the Upper Clark Fork are more than fourfold as large (figure IV-7).

Cropland and Major Crop Enterprises

Cultivated cropland comprises about 5.5 percent of the total land area. The Flathead subarea has a slightly larger proportion of its total land area in cropland than the Upper and Lower Clark Fork, but

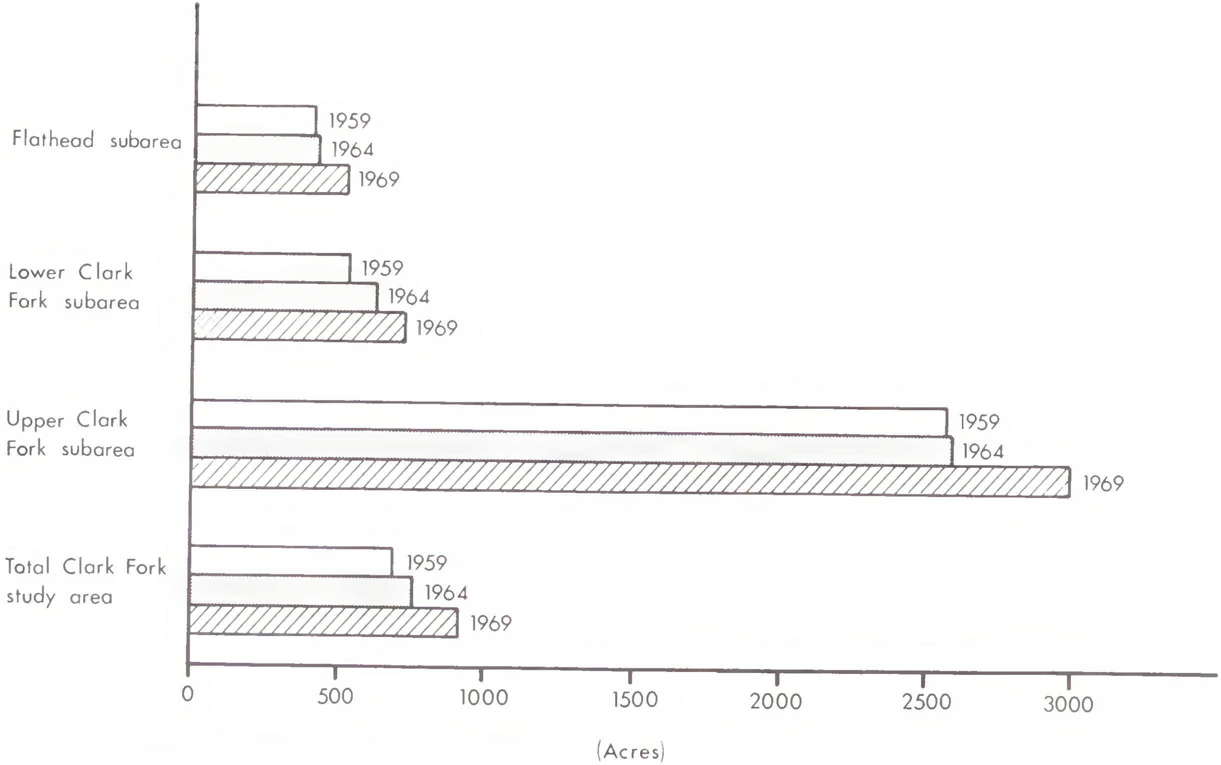
FIGURE IV-6--NUMBER OF FARMS, BY SUBAREA, 1959, 1964 and 1969
CLARK FORK OF THE COLUMBIA RIVER BASIN



U S Census of Agriculture

FIGURE IV-7--AVERAGE SIZE OF FARMS, BY SUBAREA, 1959, 1964 AND 1969

CLARK FORK OF THE COLUMBIA RIVER BASIN



U.S. Census of Agriculture

the difference is not large. Five percent of the total land area of the Flathead subarea is cultivated cropland, compared with three percent in the Lower Clark Fork and four percent in the Upper Clark Fork.

A land resource inventory recently conducted in the Clark Fork study area revealed only rather small changes in major land uses since the Soil and Water Conservation Needs Inventory was conducted in 1967. Total cultivated cropland increased about 11,000 acres in the study area. There have been, however, some significant shifts of land use within the cropland category. Since 1967 about 13,300 additional acres came under irrigation. Changes in irrigated acres occurred primarily within the Flathead subarea, with 9,800 additional irrigated acres and the remaining increase of 3,500 acres occurring in the Lower Clark Fork subarea. Table IV-8 gives the current normal irrigated land by major land use, and table IV-9 presents similar data for nonirrigated cropland. Current normal, as used here, is the average of data for 1964-1970.

Small grains and hay crops are predominant in the study area. Acreage of corn for silage is small. Barley crops are most prevalent among the small grains (table IV-10). Some malting varieties are grown, but most are feeding varieties. Irrigated wheat is mostly spring wheat, 65 percent, but 84 percent of total dryland wheat is winter wheat varieties.

Seed potatoes provide a good cash crop for a few producers. The future of sugar beets is uncertain in the study area. Current production of potatoes is limited to Lake, Flathead, and Ravalli Counties. Sweet cherries are the primary fruit crop grown around Flathead Lake and tart cherries are the main fruit crop in Ravalli County.

TABLE IV-8--TOTAL IRRIGATED LAND, BY MAJOR LAND USE, BY SUBAREA, CURRENT NORMAL 1/

CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Field crops			Rotation hay & pasture	Hay land	Total tillage rotation	Orchards	Total irrigated cropland	Irrigated permanent pasture	Irrigated range	Total irrigated land
	All row crops	Close grown crops	Total field crops								
	Acres										
Flathead	665	5,233	5,898	10,310	5,816	22,024	0	22,024	3,636	0	25,660
Lake	2,400	5,367	7,767	3,600	42,733	54,100	700	54,800	51,077	0	105,877
FLATHEAD SUBAREA	3,065	10,600	13,665	13,910	48,549	76,124	700	76,824	54,713	0	131,537
Missoula	233	3,366	3,599	2,914	16,220	22,733	0	22,733	8,350	0	31,083
Mineral	0	300	300	0	1,300	1,600	0	1,600	37	0	1,637
Sanders	0	1,234	1,234	0	15,233	16,467	30	16,497	7,551	0	24,048
Ravalli	1,748	8,094	9,842	4,900	36,461	51,203	800	52,003	62,000	0	114,003
LOWER CLARK FORK	1,981	12,994	14,975	7,814	69,214	92,003	830	92,833	77,938	0	170,771
Deer Lodge	793	1,683	2,476	500	14,433	17,409	0	17,409	7,694	0	25,103
Granite	0	1,533	1,533	0	32,967	34,500	0	34,500	7,186	0	41,686
Powell	653	3,620	4,273	3,820	54,880	62,973	0	62,973	11,460	0	74,433
Silver Bow	0	400	400	500	5,900	6,800	0	6,800	0	2,300	9,100
UPPER CLARK FORK	1,446	7,236	8,682	4,820	108,180	121,682	0	121,682	26,340	2,300	150,322
CLARK FORK SUBAREA	6,492	30,830	37,322	26,544	225,943	289,809	1,530	291,339	158,991	2,300	452,630

1/ Current normal is the average of data from 1968-1970 but does not include crop failure or non-pasture cropland grazed.

Clark Fork Type IV Soil Resource Group Survey.

TABLE IV-9--TOTAL NON-IRRIGATED CROPLAND, BY MAJOR LAND USE, BY SUBAREA, CURRENT NORMAL 1/
CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Field crops				Rotation hay & pasture	Hay land	Conservation use only	Temporarily idle cropland	Total tillage rotation	Orchards & vineyards	Open land formerly cropped	Total non-irrig. cropland
	Row crops	Close grown crops	Summer fallow	Total field crops								
	Acres											
Flathead.............	110	39,406	16,690	56,206	11,932	14,067	597	1,217	84,019	0	1,990	86,009
Lake.................	0	17,434	11,344	28,778	0	20,900	645	2,076	52,399	0	1,000	53,749
FLATHEAD SUBAREA.....	110	56,840	28,034	84,984	11,932	34,967	1,242	3,293	136,418	350	2,990	139,758
Missoula.............	0	6,700	2,737	9,437	100	6,633	0	615	16,785	0	459	17,244
Mineral..............	0	877	385	1,262	0	1,567	0	0	2,829	0	0	2,829
Sanders..............	0	6,733	4,500	11,233	0	15,267	1,407	726	28,633	0	0	28,633
Ravalli..............	0	6,866	6,500	13,366	0	1,367	0	2,024	16,757	0	83	16,840
LOWER CLARK FORK.....	0	21,176	14,122	35,298	100	24,834	1,407	3,365	65,004	0	542	65,546
Deer Lodge...........	0	400	400	800	0	0	0	1,098	1,898	0	200	2,098
Granite..............	0	1,300	1,200	2,500	0	1,533	0	0	4,033	0	0	4,033
Powell...............	0	4,575	4,200	8,775	0	6,866	130	0	15,771	0	0	15,771
Silver Bow...........	0	0	0	0	0	1,700	0	30	1,730	0	0	1,730
UPPER CLARK FORK.....	0	6,275	5,800	12,075	0	10,099	130	1,128	23,432	0	200	23,632
CLARK FORK STUDY AREA.	110	84,291	47,956	132,357	12,032	69,900	2,779	7,786	224,854	350	3,732	228,936

1/ Current normal is the average of data from [illegible] but does not include crop failure or non-pasture cropland grazed.

Clark Fork Type IV Soil Resource Group Survey.

TABLE IV-[illegible]--CROP ACREAGE AND PRODUCTION, BY SUBAREA, PRESENT NORMAL

CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Prod. unit	Flathead subarea		Lower Clark Fork subarea		Upper Clark Fork subarea		Clark Fork study area	
		Acres	Production	Acres	Production	Acres	Production	Acres	Production
Winter wheat, total	Bu.	27,733	1,154,500	12,400	379,800	1,033	25,300	41,466	1,559,600
Irrigated	Bu.	1,833	95,300	834	47,800	0	0	2,667	143,100
Non-irrigated	Bu.	25,900	1,059,200	11,566	332,000	1,033	25,300	38,499	1,416,500
Spring wheat, total	Bu.	6,234	193,900	3,651	107,800	2,766	104,200	12,651	405,900
Irrigated	Bu.	2,000	79,700	1,567	59,900	1,866	83,900	5,433	223,500
Non-irrigated	Bu.	4,234	114,200	2,084	47,900	900	20,300	7,218	182,400
Oats for grain, total	Bu.	4,399	236,600	2,883	140,500	2,251	111,100	9,533	488,200
Irrigated	Bu.	1,466	92,900	1,400	82,800	1,717	90,800	4,583	266,500
Non-irrigated	Bu.	2,933	143,700	1,483	57,700	534	20,300	4,950	221,700
Barley for grain, total	Bu.	26,700	1,321,200	12,834	655,500	6,867	272,030	46,401	2,248,730
Irrigated	Bu.	5,100	306,700	7,700	459,700	3,434	160,300	16,234	926,700
Non-irrigated	Bu.	21,600	1,014,500	5,134	195,800	3,433	111,730	30,167	1,322,030
Corn for silage, total	Ton	434	6,600	666	11,641	0	0	1,100	18,241
Irrigated	Ton	434	6,600	666	11,641	0	0	1,100	18,241
Non-irrigated	Ton	0	0	0	0	0	0	0	0
Irish potatoes, irrigated	Cwt	2,632	620,200	615	127,100	1,446	264,500	4,693	1,011,800
Hay, all	Ton	107,999	208,855	103,866	238,867	123,100	225,126	334,965	672,848
Irrigated	Ton	59,266	135,171	77,932	203,569	113,000	212,166	250,198	550,906
Non-irrigated	Ton	48,733	73,684	25,934	35,298	10,100	12,960	84,767	121,942
Alfalfa, all	Ton	66,099	142,716	57,066	152,693	35,766	89,759	158,931	385,168
Irrigated	Ton	34,866	92,918	41,200	129,752	32,933	85,625	108,999	308,295
Non-irrigated	Ton	31,233	49,798	15,866	22,941	2,833	4,134	49,932	76,873
Other hay, total	Ton	41,900	66,139	46,800	86,174	87,334	135,366	176,034	287,679
Irrigated	Ton	24,400	42,253	36,732	73,817	80,067	126,540	141,199	242,610
Non-irrigated	Ton	17,500	23,886	10,068	12,357	7,267	8,826	34,835	45,069
Sugar beets, irrigated	Ton	0	0	700	12,600	0	0	700	12,600
Apples, total	Lbs.	140	255,000	453	438,600	0	0	593	693,600
Irrigated	Lbs.	90	180,000	453	438,600	0	0	543	618,600
Non-irrigated	Lbs.	50	75,000	0	0	0	0	50	75,000
Sweet cherries, total	Lbs.	910	6,144,000	372	2,976,000	0	0	1,282	9,120,000
Irrigated	Lbs.	610	4,944,000	372	2,976,000	0	0	982	7,920,000
Non-irrigated	Lbs.	300	1,200,000	0	0	0	0	300	1,200,000
Pears, irrigated	Lbs.	0	0	5	6,000	0	0	5	6,000
Cropland pasture, total	AUM	4,140	17,100	193	1,200	0	0	4,333	18,300
Irrigated	AUM	3,800	16,700	193	1,200	0	0	3,993	17,900
Non-irrigated	AUM	340	400	0	0	0	0	340	400
Permanent pasture, total	AUM	103,245	252,900	110,771	346,492	47,745	120,114	261,761	719,506
Irrigated	AUM	54,713	210,400	77,938	319,800	26,340	97,100	158,991	627,300
Non-irrigated	AUM	48,532	42,500	32,833	26,692	21,405	23,014	102,770	92,206
Range, total	AUM	224,392	59,400	420,899	109,963	835,765	246,159	1,481,056	415,522
Irrigated	AUM	0	0	0	0	2,300	7,500	2,300	7,500
Non-irrigated	AUM	224,392	59,400	420,899	109,963	833,465	238,659	1,478,756	408,022
Private forest land grazed	AUM	327,270	48,784	850,962	88,326	429,671	85,970	1,607,903	223,080

Montana Agricultural Statistics and Clark Fork Soil Resource Group survey.

Hay crops occupy by far the most acres of cropland in the study area. The trend has been toward alfalfa hay, with reduction in miscellaneous hays. Wild hay has been important in the past. Much of the acreage of wild hay has been improved, and domestic species have been introduced for higher yields.

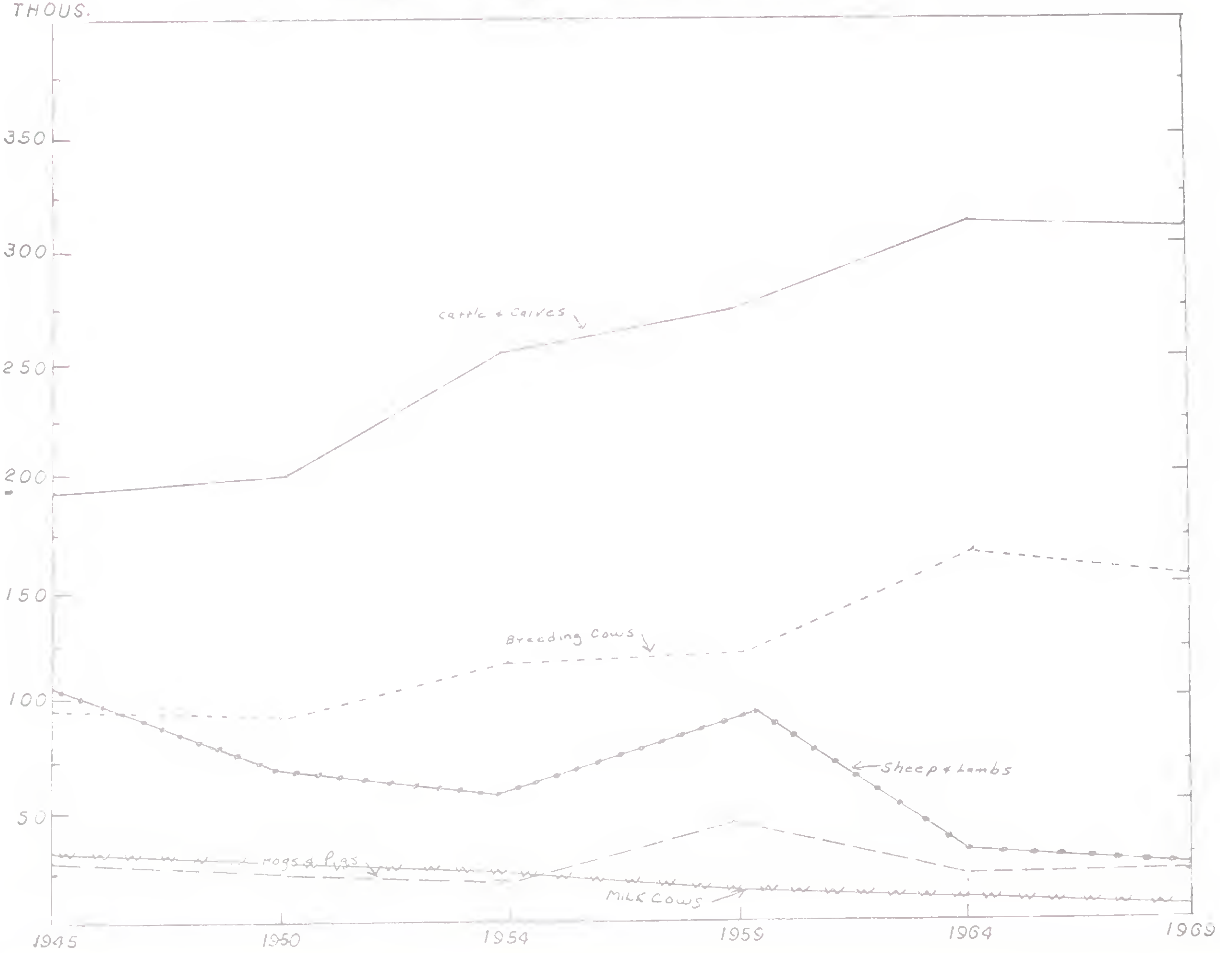
Major Livestock Enterprises

Trends in livestock numbers in the study area are presented in figure IV-8. The overall trend in the study area generally follows the national trend of increasing numbers of beef cows and declining numbers of sheep and lambs. Numbers of cows kept for milking have declined consistently.

Nationally, sheep numbers have declined at an average of four percent annually from 1960 to 1970. Factors which have contributed to decline in number of sheep and lambs in the study area are generally the same forces common throughout the West. They are: scarcity of experienced labor, high costs of production in the sheep industry, predator problems, reductions in use of public lands for grazing, and perhaps most important, a general lack of enthusiasm among young producers for sheep production. There are indications, however, that the downward trend is leveling off, as the decline was rather small between 1964 and 1969.

Since 1969 the increase in beef cattle inventory has continued and accelerated. The national cattle inventory rose two million head per year in 1969 and 1970; three million in 1971; and four million in 1972; and the Economic Research Service is estimating that the increase

FIGURE IV-[illegible] LIVESTOCK INVENTORIES, 1945-1969
CLARK FORK OF THE COLUMBIA RIVER BASIN



in 1973 far exceeded that of the previous year. In the Clark Fork study area, the cattle inventory decreased from 317,300 in 1972 to 314,800 in 1973 and then expanded to 323,000 in 1974.

During 1971, a total of 270,000 cattle and calves were placed on feed in Montana. As of January 1, 1972, there were 6,400 head of cattle on feed within the Clark Fork study area. About 90 percent of that number were in Flathead, Powell, and Ravalli Counties.

Volume and Value of Agricultural Output

For analytical purposes the agricultural sector has been disaggregated into seven subsectors. Six of them are crop or livestock producing and one is an agricultural services category. In 1970 the total value of output for the group of agricultural sectors totaled $66,511,000. This figure exceeds farm sales ($51,341,500) as some output is not marketed directly, but becomes factor inputs for other enterprises such as feed to livestock. Value of products consumed on the farm is also included in total farm output. Essentially, this methodology is based upon the farm enterprise type of accounting and will be part of an interindustry input-output analysis.

The range livestock enterprise accounted for almost half of the value of agricultural output of the study in 1970 (table IV-11). Field crops other than cash grains ranked second in terms of value. The Flathead subarea had 42 percent of the total value of production; the Lower Clark Fork, 35 percent; and the Upper Clark Fork, 23 percent.

TABLE IV-11--VALUE OF AGRICULTURAL OUTPUT, BY SECTOR, 1970
CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Amount	Percent of Total
	1,000 dollars	
Livestock (range and pasture-fed)	29,773	45
Fed cattle	2,207	4
Dairy	4,952	7
Cash grain	4,622	7
Other field crops	18,228	27
Agricultural services	2,187	3
All other agriculture	4,542	7
TOTAL	66,511	100

Employment and Income

In 1970 farm wage and salary employment totaled 1,180 persons. An additional 187 were employed in agricultural services and 112 in forestry enterprises (does not include logging or wood products under Standard Industrial Classification category). In addition to the wage and salary employees, there were approximately 3,930 farm proprietors who were mainly actively engaged in the operation of farms and ranches.

A related factor is off-farm employment by farm operators in the study area. Nearly half the total number of farms in the study area had operators who worked off their farms 100 days or more, and 35 percent had 200 or more days of off-farm employment. See table IV-5.

Wages and salaries from farm and farm-related sources are rather small in the context of the entire economy of the study area. Only in the Lower Clark Fork did they exceed two million dollars. Total wages and salaries from farms and related services totaled $5,152,000 in 1970.

Employment and Income in Related Trade Service and Processing Industries

Transactions in the agricultural sector--marketing of agricultural products or purchasing supplies or equipment--triggers economic activity in other sectors of the economy. Trade, processing, and service sectors most closely related to agriculture within the study area are the food and kindred products manufacturing sector, the transportation sector, the trade sectors, particularly gasoline retail outlets and farm machinery dealers, financial institutions, and selected services.

Without some specialized analytical tools, it is impossible to determine the precise level of employment in the nonagricultural sectors which was engendered by agricultural production. This aspect will be explored in a subsequent section. Employment and earnings for selected sectors are given in table IV-12.

TABLE IV-12--EMPLOYMENT AND EARNINGS IN AGRICULTURALLY RELATED INDUSTRIES
1970
CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Employment[1/]	Earnings
	Number	1,000 dollars
Food & kindred products	670	5,206
Retail trade		
Building materials & farm equipment	409	2,779
Automotive dealers & service stations	2,208	2,638
Finance, insurance, and real estate	1,856	2,784
Utilities	760	8,854
Services	10,420	58,854
Transportation	3,136	37,378

[1/] In some instances, these data are not comparable to census data in table IV-1 because these are employment covered by unemployment compensation.

Capital Investment

In recent years, real estate values in Montana have either kept pace with or exceeded the overall national upward trends. Value of land and buildings in the Clark Fork study area exceeds the state average when viewed from a per-acre-in-farms perspective, but is considerably below the state average on a per-farm basis. Data in table IV-13 highlight some of the characteristics of farm values in the study area.

Average figures for per-farm and per-acre include values for both irrigated and nonirrigated lands. In recent years increases in the value of grazing land have outpaced the increase in value of irrigated cultivated land. In Montana, values of grazing land increased 29 percent between 1964 and 1969 and then increased another 59 percent between 1969 and 1973. Increases for irrigated land for the same period were considerably less.

Upward pressures in real estate values appear, in many instances, to be closely correlated with earnings from farm and ranch production. Markets are highly localized in nature, however, and in some areas nonfarm demand, such as subdivisions for summer homes, etc., have a greater impact on farm real estate values than does present or potential agricultural production.

TABLE IV-13--VALUE OF LAND AND BUILDINGS IN FARMS, BY SUBAREA, 1969
CLARK FORK OF THE COLUMBIA RIVER BASIN

Subarea	Total	Average per farm	Average per Acre in Farms
	1,000 current dollars	- - - - - Current dollars	- - - -
Flathead	136,920	74,534	142.00
Lower Clark Fork	139,061	86,426	119.45
Upper Clark Fork	101,772	210,272	70.10
Total Study Area	377,753	96,120	105.53

Timber Resources and Related Economic Activity

Substantial portions of six National Forests--the Bitterroot, Deerlodge, Flathead, Helena, Kootenai, and Lolo--lie wholly or largely within the Clark Fork study area. 1/ National Forest areas are shown in table IV-14. This, in addition to other forested land, totals 10,404,000 acres and provides a basis for a substantial wood products industry as well as playing a fairly significant role in the agricultural economy of the area.

For purposes of nomenclature, forest lands are usually grouped into two major categories--commercial and noncommercial. Commercial forest lands are those capable of producing at least 20 cubic feet of new wood per acre per year. A further requirement for the commercial classification is that the land not be restricted from timber utilization

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1/ The same ten-county area used in the rest of the economic data.

TABLE IV-14--NET NATIONAL FOREST ACREAGE BY COUNTY CLARK FORK OF THE COLUMBIA RIVER BASIN

County	NATIONAL FOREST							
	Bitterroot NF	Deerlodge NF	Flathead NF	Helena NF	Kaniksu NF	Kootenai NF	Lolo NF	Total
Deer Lodge		136,860 1/						136,860
Flathead			1,724,194			25,398 2/	18,747	1,768,339
Granite		443,756					216,854	660,610
Lake			162,960				39	162,999
Lewis & Clark			40,326	236,655 2/			74,332	351,313
Lincoln			15,723		5,424 2/	10,662 2/		31,809
Mineral							646,890	646,890
Missoula	11,254		167,977				497,669	676,900
Powell		85,052		160,351			144,688	390,091
Ravalli	1,103,829						5,687	1,109,516
Sanders					426,024		484,767	910,791
Silver Bow		1/						1/
TOTAL	1,115,083	665,668	2,111,180	397,006	431,448	36,060	2,089,673	6,846,118

Source: River Basin Planning Staff

1/ Silver Bow and Deer Lodge County acreages were not separated when the Butte Ranger District was planimetered for its Clark Fork portion. This is not an official acreage and should be rounded to the nearest 1,000 acres.

2/ These are not official acreages and should be rounded to the nearest 1,000 acres.

by statute or administrative regulation. Noncommercial forests are those not capable of yielding the 20 cubic feet annual growth per acre or the land has been withdrawn from timber use through statute or administrative regulation.

TABLE IV-15--COMMERCIAL AND NONCOMMERCIAL FOREST LAND BY OWNERSHIP--1970
CLARK FORK OF THE COLUMBIA RIVER BASIN

Ownership	Commercial	Noncommercial	Total
	- - - - - - - - - Thousands of Acres - - - - - - - - - -		
Federal	4,758	2,371	7,129
Nonfederal	3,065	210	3,275
Total	7,823	2,581	10,404

Sources: Forest Survey and Conservation Needs Inventory

Extent and Nature of the Commercial Timber Resource

An extensive volume of timber has been harvested from the forests of the Clark Fork study area. In spite of this abundant harvest, there are still large acreages of sawtimber in all of the commercial forests as shown in table IV-16.

TABLE IV-16--AREA OF COMMERCIAL FOREST LAND BY STAND-SIZE, CLASSES, AND OWNERSHIP GROUPS--1970

CLARK FORK OF THE COLUMBIA RIVER BASIN

Stand-size Class	All Ownerships	National Forest	Other Federal & State	Forest Industry	Farmer and Miscellaneous Private
	- - - - - - - - - - - - Thousand Acres				- - - - - - - - - - - - -
Sawtimber stands	4,367	2,239	631	537	960
Poletimber stands	2,427	1,549	225	141	512
Sapling & seedling stands	905	706	67	29	103
Nonstocked areas	124	87	11	8	18
All classes	7,823	4,581	934	715	1,593

Source: Forest Survey: Intermountain Forest and Range Experiment Station, Ogden, Utah

The principal species of the area, as shown in table IV-17, are Douglas-fir, lodgepole pine, larch, ponderosa pine, and the true firs. In terms of commercial forest areas, Douglas-fir and lodgepole pine are of equal occurrence--about 60 percent of the total commercial forested acreage. Fourteen percent is ponderosa pine, 9 percent is larch, and 9 percent is true fir. This is the largest block of western larch in the United States--over half of the total national acreage. Miscellaneous types, pines and spruce, make up the remaining acreage.

TABLE IV-17--AREA OF COMMERCIAL FOREST LAND BY FOREST TYPE AND OWNERSHIP GROUPS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Forest Type	All Ownerships	National Forest	Other Public	Forest Industry	Farmer and Miscellaneous Private
	- - - - - - - - - - -	- - - - - -	Thousand Acres	- - - - - -	- - - - - - - -
Douglas-fir	2,447	1,278	355	239	575
Ponderosa pine	1,068	252	207	271	338
Lodgepole pine	2,259	1,665	180	88	326
White pine	38	29	2	7	---
Hemlock-redcedar	66	60	5	1	1/
Larch	734	261	131	82	260
True firs	734	714	10	1/	10
Spruce	360	271	35	8	46
Other	117	51	9	28	38
All forest types	7,823	4,581	934	715	1,593

Source: Forest Survey

1/ Less than 500 acres

Information on acreage distribution of forest land is of significance to resource planners. However, data on acreage may be misleading as far as volume of timber is concerned. Volume varies widely between species and different soil types and terrain. The average volume in mature sawtimber stands in the study area is only 10,860 board feet per acre. The area has a much better potential, however. Overcrowding, disease, and overcutting in past years all contribute to this rather low average. Timber value is directly related to tree girth size. The average diameter of harvested Engelmann spruce and western larch sawtimber is 18 inches; Douglas-fir, just slightly smaller--16.2 inches; and ponderosa pine, 17.8 inches. Lodgepole pine is a species of major occurrence, ranking equal to Douglas-fir. It is, however, a small tree and its small size is usually compounded by overcrowding. In the study area, lodgepole pine sawtimber averages only about 13 inches in diameter. Table IV-18 presents current estimates of timber volume for the study area.

TABLE IV-18--NET VOLUME OF GROWING STOCK AND SAWTIMBER ON COMMERCIAL FOREST LAND BY OWNERSHIP GROUPS--1970

CLARK FORK OF THE COLUMBIA RIVER BASIN

Ownership	Growing Stock 1/ Billion Cubic Feet	Sawtimber 2/ Billion Board-Feet
National Forest	9.30	31.60
Other public	1.58	6.17
Forest industry	1.49	6.91
Farmer & misc. private	2.49	9.62
All ownerships	14.86	54.30

Source: Forest Survey

1/ All live trees 4.0 inches or larger in diameter. These data are used in forest management.

2/ All live trees 9.0 inches or larger in diameter. These data are used in timber harvest.

Growth

Net annual growth of growing stock and sawtimber largely determines the annual allowable cut on a sustained yield basis. Mortality, whether from fire or from natural causes such as insects and disease or overcrowding,

TABLE IV-19--ANNUAL GROWTH RELATIONSHIPS ON COMMERCIAL FOREST LAND BY OWNERSHIP GROUPS--1970

CLARK FORK OF THE COLUMBIA RIVER BASIN

Concept	All Ownerships	National Forest	Other Federal & State	Forest Industry	Farmer and Miscellaneous Private
	- - - - - - - - - - - -	- - - Millions of	Cubic Feet - - -	- - - - - -	- - - - - -
Growing stock 1/					
Annual gross growth	389	269	33	30	57
Mortality (loss)	96	69	7	10	10
Net growth	293	200	26	20	47
Potential gross growth	647	463	53	43	88
Sawtimber 2/	- - - - - - - - - -	- - - Millions of	Board Feet - - -	- - - - - -	- - - - - -
Annual gross growth	1,328	838	138	134	218
Mortality (loss)	358	247	29	43	39
Net growth	970	591	109	91	179

Source: Forest Survey

1/ All live trees 4.0 inches or larger in diameter
2/ All live trees 9.0 inches or larger in diameter

Utilization: Kind, Volume, and Value of Output

In spite of significant mortality, the annual harvest of timber has been considerably below the estimated annual allowable cut during the past several years. In 1970 the total harvested was approximately 75 percent of what was considered allowable according to the comparison of net annual growth of sawtimber on all ownerships in table IV-19 and the total of table IV-20. There are a number of reasons the harvest has not equaled the annual allowable. Some of the timber is found in marginal areas where costs are prohibitive. Weather, strikes, and fluctuations in the marketplace have also played their roles.

TABLE IV-20--HARVESTS FROM SAWTIMBER INVENTORY--1970
CLARK FORK OF THE COLUMBIA RIVER BASIN

Ownership	Million Board-Feet
National Forest	412.6
Other public	87.4
Forest industry)	229.5
Farmer and miscellaneous private)	
Total	729.5

Source: River Basin Staff

Eighty-five percent of the timber harvested from the forest land in the Clark Fork study area was used as sawlogs for lumber production while the rest was used for veneer logs, pulpwood, and other uses. Some logging residues, which in the past would have been left in the forest, were also removed. This and other removals are not accounted for in the sawtimber inventory and therefore amounted to a 10 percent extension of the output from the resource.

TABLE IV-21--HARVEST FROM SAWTIMBER INVENTORY BY PRODUCT ON COMMERCIAL FOREST LAND--1970

CLARK FORK OF THE COLUMBIA RIVER BASIN

Product	Million Board-Feet	Percent of Total
Sawlogs	621.9	85.3
Veneer logs	97.1	13.3
Pulpwood	3.5	.5
Commercial poles	1.6	.2
Mine timbers	2.2	.3
Miscellaneous industrial wood 1/	1.4	.2
Posts, fuelwood, and miscellaneous farm timbers	1.7	.2
All products 2/	729.5	100.0
Logging residues 3/	59.3	8.1
Other removals 3/	13.4	1.2

Source: USDA Forest Service Resource Bulletin INT-10, 1974.

1/ Includes house logs, converter poles, piling, shingle bolts, excelsior bolts, match stock, charcoal wood, etc.

2/ Debit against inventoried volume.

3/ Not accounted for in inventory above because it is dead or too small

In considering the value of output, the wood must be considered first as unprocessed sawlogs, round logs, or cordwood, and secondly as finished lumber, plywood, etc. Initially there is a stumpage charge, usually based upon the quality of the timber stand, the relative ease of harvesting, and location of the forest. The approximate raw material value of the wood removed in 1970 was 18.5 million dollars in 1967. The value added to this raw material as it was processed into lumber and plywood brought the wholesale value of this material to approximately 200 million dollars in 1972 dollars.

Employment and Income in Primary Processing

Employment and income in the primary wood products sector are mainstays of the economy of the study area. In 1970 there were 1,305 workers employed in logging camps and as logging contractors. Essentially, they produce rough primary forest or wood products. In addition, there were 4,370 employees in the wood processing industries such as sawmills, etc. Earnings for the loggers and logging contractors totaled $5.4 million in 1970 and earnings from other primary processing of wood products totaled $44.8 million.

Employment and Income in Related Trade and Service Industries

Basic industry to total industry employment multipliers were derived from census data for the study area and subareas. These multipliers approximate the relationship between forestry and forest products industry compared with total industry. These multipliers were used to develop data in table IV-22.

TABLE IV-22--FORESTRY AND RELATED INDUSTRY EMPLOYMENT CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Subareas			
	Flathead	Lower Clark Fork	Upper Clark Fork	Study Area Total
	- - - - - - - - Persons	- - - - - - - - -		
SIC 24 1/	---	---	---	5,339
SIC 26	---	---	---	336
Forest Mgmt.	---	---	---	940
Total Basic Empl.	2,183	4,101	331	6,615
Secondary Empl.	2,870	5,008	325	8,203
Total Employment	5,053	9,109	656	14,818

Source: U. S. Census and River Basin Planning Staff 1970

SIC = Standard Industrial Classification

Data from table IV-22 were combined with levels of earnings in types of employment to develop tables IV-23 and IV-24, which show the relative economic importance of the forest industry to the income and employment of the basin.

TABLE IV-23--FORESTRY AND RELATED INDUSTRY EARNINGS CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Subareas			
	Flathead	Lower Clark Fork	Upper Clark Fork	Study Area Total
	- - - - - - - - - ($1,000)	- - - - - - - - -		
SIC 24	---	---	---	38,099
SIC 26	---	---	---	3,143
Forest Mgmt.	---	---	---	7,165
Total Basic Empl.	15,975	30,012	2,420	48,407
Secondary Empl.	19,889	34,706	2,252	56,847
Total Earnings	35,864	64,718	4,672	105,254

Source: U. S. Census and River Basin Planning Staff 1970
Earnings from USDA Forest Service Research Paper INT-172, 1975.

TABLE IV-24--IMPORTANCE OF FORESTRY INDUSTRY RELATED TO TOTAL INDUSTRY
CLARK FORK OF THE COLUMBIA RIVER BASIN

	Subareas			
Item	Flathead	Lower Clark Fork	Upper Clark Fork	Study Area Total
	- - - - - - Percent of Total - - - - - -			
1. Manufacturing Empl.	66	99+	10	66
2. All Basic Empl.	31	32	3	21
3. Wages & Salaries	40	40	3	27
4. Personal Income	24	26	2	17

Source: U. S. Census and River Basin Planning Staff 1970

Capital Investment in Forestry Industries 1/

Expenditures to replace or expand existing capital investment in mills and equipment have been increasing statewide in most industries. Almost without exception, lumber and wood products industries have led the field in new capital investment, accounting for over 25 percent of the state total in recent years. After such heavy expenditures for new mills and equipment, one would expect increases in productivity in terms of value added per employee hour, but such increases are not evident. Perhaps more lag-time is needed to bring out these gains--or perhaps the heavy investments have merely forestalled an otherwise decline in labor productivity. Factors contributing to keeping productivity down include: decreased size of trees which reduces harvest and mill efficiency; shift of harvesting to more inaccessible and steeper sites which reduces harvesting efficiency; and stricter regulation of logging

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1/ Material paraphrased from A Profile of Forestry Employment in Montana, by Richard L. Porterfield, USDA Forest Service Research Paper INT-172, 1975.

practices on public land to protect the environment which has increased costs and reduced harvest efficiency. Maximum production capacity of 1,094 million board-feet in 1970 exceeded net growth and allowable cut for that year.

Outdoor Recreation

It is hard to make a clear statement on the economic importance of outdoor recreation in the study area. The Montana Department of Highways estimates that during 1971 approximately 3.77 million out-of-state tourists spent, on the average, about $40 per visit within the state. It is estimated that tourist expenditures exceeded $150 million in 1971. The study team estimates that as much as 25 percent of this total state expenditure could have taken place within the Clark Fork study area. About 22 cents out of each dollar spent by the "average" out-of-state tourist is estimated to become direct basic income to Montanans.[1] On this basis, tourism provides about 8.25 million dollars in basic income to basin residents. Assuming $9,000 per man-year of employment, this would provide about 900 man-years of basic employment. The basic-to-total-employment multiplier is estimated at 2.24 for the study area. Thus, total employment impact attributable to tourism is estimated at 2,000 man-years of employment or about three percent of total employment in the basin. However, major weaknesses of tourist industry employment include seasonality and very low wages. In addition, many employees are out-of-state students who take much of their summer wages home with them.

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[1] Polzin, Paul E., and Dennis L. Sweitzer, *Economic Importance of Tourism in Montana*, USDA Forest Service Paper INT-171, July 1975

This is an estimate of "tourism" which contains that sort of outdoor participation which brings new money into the study area. The current level of recreation participation in the study is estimated to be 14.9 million activity occasions as shown in table IV-39. A portion of this activity takes place in Glacier National Park which recorded 1.57 million visitors in 1975. Recreation on National Forest land was estimated at 10.2 million recreation days of use in 1975. The units of recreation available from the several sources mentioned are not additive. However, each source of information has its own special contribution to the study. For example, projections are available only in terms of activity occasions while cross sectional detail is available only in terms of visitor-days on National Forest land. An example of this cross sectional detail is depicted in table IV-25 which cross-tabulates the kinds of activity by the kinds of places where they take place.

The recreation budget on National Forest lands amounts to about $____________ per acre and $____________ per visitor-day of estimated use during the base period.

Gross receipts and cost information are not available on private enterprise in outdoor recreation for the basin.

The 16 largest communities in the study area budget about $280,000 for recreation programs on 971 acres of urban parks. This budget amounts to about $290 per acre of urban park and represents an average of about $3 per person living within the limits of the same 16 cities.

Aquaculture

Aquaculture includes the practice of raising fish in closely managed areas. Two distinct segments of the aquaculture industry in this basin are considered in this report.

TABLE IV-[illegible]--ESTIMATED RECREATION USE OF NATIONAL FOREST LAND BY KINDS OF ACTIVITY AND PLACES OF OCCURRENCE, 197[illegible]

CLARK FORK OF THE COLUMBIA RIVER BASIN

Thousands of Recreation Days

	Observation Site	Boating Sites	Swimming Sites	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Roads	Trails	Lakes, Reservoir & Impoundments	Rivers & Streams	Wilderness	Other Undeveloped Areas	Total On Undeveloped Areas	Total National Forest Area
	DEVELOPED SITES									UNDEVELOPED AREAS							
General Leisure & Sightseeing	178.8	4.8	6.8	4.0				6.0	200.4					118.0	14.4	132.4	332.8
Travel:																	
Motorized		36.2		1.[illegible]		2.3		[illegible]	[illegible]	[illegible]	[illegible]	73.4	3.2		142.3	4068.[illegible]	4161.[illegible]
Hiking										31.[illegible]	[illegible]	145.8	7.2		284.6	773.8	773.8
Other		12.[illegible]				1.4	1.[illegible]		15.3			21.8	23.3			45.6	60.9
Team Sports & Play				25.8	[illegible]	1.2	6.[illegible]		72.0								72.0
Water Sports		32.5	98.0			[illegible]	14.[illegible]		[illegible]			141.0	31.5			172.5	330.0
Fishing		.9							1.2			381.9	376.8			758.7	759.9
Camping		1.5		619.[illegible]	[illegible]		[illegible]		686.[illegible]		.4	1.4	.6	2.0	54.0	58.4	744.7
Picnicking	43.8	21.0	16.2	175.8	[illegible]	1.2			453.[illegible]		[illegible].8				418.2	420.0	873.0
Winter Sports				11.[illegible]	[illegible]			[illegible]1.3	14[illegible]		.5	1.7	.7	6.0	33.6	42.5	184.2
Hunting												12.3	15.3	71.4	871.8	970.8	970.8
Receiving Visitor Information Services	46.8	1.2		[illegible]	41.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				3.6	301.2	513.6
Other				[illegible]		[illegible]		[illegible]	[illegible]					26.4	171.6	198.0	448.[illegible]
All Activities	264.[illegible]	[illegible]	121.0	[illegible]08.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	459.5	[illegible].3	1494.[illegible]	[illegible]942.1	10225.[illegible]

The first segment is concerned with the production of fish for conservation purposes such as the stocking of streams and lakes. This conservation segment is limited to three hatcheries operated by the Montana Department of Fish and Game, one federal hatchery operated by the U. S. Fish and Wildlife Service, and one private hatchery which is affiliated with the Confederated Salish and Kootenai Tribes. Approximately four and one-half million fish were raised by these five hatcheries during 1974 for stocking in streams and lakes.

The second segment is the commercial fishery which raises fish for market consumption and for stocking private fishing ponds. The first commercial fish business was started in the basin in the early 1930's. Since then the industry has increased in size to a point where in 1974 there were three hatcheries and 17 commercial fish farms. During 1974 these facilities produced approximately three million small fish for stocking purposes and 80 thousand pounds of fish for the commercial market.

The primary consideration for the location of aquaculture facilities is the availability of a water supply with the quality and quantity suitable for operation of an economic unit. Almost 95 percent of all aquaculture operations in the basin are located in the Flathead subarea. The majority of the operations obtain their water from warm water springs or artesian wells. Based on commercial fish farm data and present practices of single-pass flows, one cfs (450 gallons per minute) can support an annual fish production of approximately 10,000 pounds. Aquaculture is a nonconsumptive use of water in that nearly all of the water used is passed back into streams or is available for other uses.

Relationship Between Present Economic Situations and NED Specific Components

The present economic situations of the three subbasins are partial results of some of the problems discussed in chapter III. The specific components of the objectives could help solve those problems and improve the future economic conditions in the basin. The following discussion is intended to illustrate the relationship between the present economic situation and the specific components of the plan identified thus far.

(1) The natural resource base is declining, thereby reducing the extractive economies of agriculture, mining, and forestry.

Upper Clark Fork: The persistent decline in employment in mining and smelting is only partially offset by increases in employment at the penitentiary and state hospitals. Although agriculture, forestry, and forest products employments are relatively stable, they account for only seven percent of total employment.

Lower Clark Fork: The decline in employment in agriculture, forestry, and wood products is more than offset by increased employment at the University of Montana. However, that employment is now leveling off.

Flathead: A decline in agriculture and forestry employment has been offset by an increase in forest products, smelting, other manufacturing, and community college employment. Agriculture and forestry programs cannot solve all the problems, but wise use of our remaining land base and natural resources could help to maintain the basic employment of the basin. This wiser use should result in increased or more efficient output of food and fiber.

(2) The reduction of flood damages on agricultural and residential lands, while not a large threat to the economy of the area, would result in less expenditure of money for materials produced outside the basin. Agricultural production is affected very little by flooding due to timing of runoff and low productivity of gravelly bottomland soils now flooded. Some irrigation diversions are damaged by floods where they are poorly designed or inadequately protected.

(3) Wetlands produce less than their potential. Some wetlands can be drained to increase the production of food and fiber. Returns for investment in drainage are among the highest in agriculture because of greater efficiency in use of nonland resources. However, each drainage unit must stand on its own evaluation.

(4) Provision of late season water would increase efficiency and production on those acres now short and would result in more complete employment of underemployed labor and machinery.

(5) While inadequate water systems and supplies are not a large economic problem in the basin, having a good, reliable water source and system does have its advantages--both economically and socially. For that reason, this study addresses the problem of improving water supply systems in the basin.

(6,7,8,9,10) Recreation, while not a major basic industry in the basin, does provide many seasonal jobs and is a large part of the service and retail trade industries. This study describes the type, location, and supply of recreation facilities, their economic condition, and the availability and diversification of the recreation opportunity. Increased access to public lands, streams, and lakes would disperse recreational use and improve the quality of recreation that may attract more tourists and increase income to the area. Better boating access on fluctuating reservoirs would have a similar effect.

(11,12) Land treatment measures on cropland, range, and forests would increase the production of agricultural and forest products resulting in higher incomes to those employed therein. Some additional employment would result from the installation of the land treatment. Prevention of erosion of "other" land would make the area more attractive to tourists and prospective light industry.

(13,14,15) The declining forest industry is a result of decreasing amounts of large-diameter timber and a lack of product-finishing industries in the basin. By growing more sawtimber-sized trees and expanding the use of available wood, the forest products industry could be sustained. By diversification of products, that is, finishing more products within the basin rather than shipping the raw material out of state, the forest industry employment could be increased.

(16) In order to make efficient use of the natural resources, increase light industry, increase sprinkler irrigation, and replace natural gas heating in homes, there will have to be more electricity generated in the basin or imported from outside the basin. All of these specific NED objective components relate to maintaining or increasing employment and income opportunities in the basin.

In 1970, Montana used a little over six percent of energy sold in the Pacific Northwest. Electric energy generated in the Clark Fork Basin was 4,278 million kwh or about four percent of the total energy generated in the Pacific Northwest during 1970. Maximum peak generating capacity available in that year in western Montana amounted to about 1,015 mw. This was less than five percent of the Pacific Northwest area peak capacity.

There is a large potential for hydroelectric development in the Clark Fork Basin. About 2,000 mw of nameplate capacity of potential hydroelectric power projects in Montana could be reexamined in light of changing power values and the needs of the Pacific Northwest for electric power.

PRESENT ENVIRONMENTAL SITUATION

The present environmental quality of the basin is excellent in relation to environmental quality of most regions of the United States. Many areas can still be considered in pristine condition in that pollution is very minor. Because of the excellent environmental conditions, deterioration of environmental quality of a minor nature is readily recognized by the public.

Land

Long before the presence of white men in the basin, the Indians used the Flathead area as a common hunting zone while they lived in other parts of the basin. The landform was approximately as we see it today; and timberlines, valleys, meadows, and other features have probably remained fairly stable.

Like the present inhabitants of the basin, the Indians spent the majority of their time in the valley bottoms and only occasionally ventured to the mountaintops. Wildlife was not in great abundance as expressed in today's terms. The Lewis and Clark expedition (1805-1806) noted in their journals that game was scarce in the mountain areas.

Lewis and Clark were followed by the increased number of trappers during the fur trade era which lasted until the 1850's. Like the Indians, the trappers killed only enough game to satisfy their own needs, but they did exploit populations of beaver and other furbearing animals. The associated decline of beaver populations in the upper headwaters of the basin eliminated many of the small beaver dams.

Major changes of land use in the basin began in the 1850's with the appearance of permanent settlements for mining and agricultural purposes. Land use changes continued with the introduction of the livestock industry in the 1860's. Also during the 1850's and 1860's, there was an urgent demand for meat for the increasing human population and heavy commercial hunting reduced game numbers. Conservation programs aimed at protecting the wildlife resource were first instituted in the late 1860's, but it was not until 1872 that the hunting of big game was regulated. In the 1890's the railroads arrived, and they acquired vast acreages of land. This led to the beginning of a large timber industry, which along with agriculture, dramatically changed the former land use pattern.

The first National Forests were reserved in the basin on March 1, 1898, and Glacier National Park was established on May 11, 1910. There was an increasing environmental awareness in the 1930's and 1940's which, among other things, brought about the development of the Soil

Conservation Service. In 1940, the 949,356-acre Bob Marshall Wilderness Area was set aside as a permanent reserve; 709,356 acres are in the basin.

During the 1930's the wildlife populations reached high densities, but overgrazing by wildlife and domestic livestock during the drought left the winter range in a deteriorated condition. This condition led to a rapid decline of wildlife numbers which continued into the 1940's. Scientific game management to provide maximum game populations consistent with habitat was initiated in the 1940's by state and federal management agencies. This program was aimed at preservation of critical habitat and management of population numbers.

The 1930's and 1940's saw a dramatic increase in mechanization in agriculture, mining, and forestry. Mechanization, combined with other industrial expansion, had adverse effects on the environment, resulting in increased erosion, sedimentation, pollution, and damage to open and green space.

At present, the basin reflects the accumulation of effects of land use changes on the environment. More environmental concern has led to land use regulations, mine reclamation laws, improved timber harvest techniques, and additional reserved areas such as wilderness and primitive areas. On September 17, 1974, Glacier National Park was designated as a World Biosphere Reserve.

The quality of the present environment can be described by listing environmental parameters such as major land use withdrawals and wildlife species. There are presently 1,198,524 acres of wilderness area; 673,694 acres of federal wilderness study areas; 655,700 acres of proposed wilderness area; 133,800 acres of Montana wilderness study areas; and 219 miles of federal study rivers (see table IV-26).

TABLE IV-26--EXISTING AND PROPOSED LAND AND RIVER RESERVATIONS CLARK FORK OF THE COLUMBIA RIVER BASIN

Designated Area	Date	Acres
Wilderness Areas		
Bob Marshall	1940	709,356
Anaconda-Pintlar	1962	85,979
Selway-Bitterroot	1963	254,480
Cabinet Mountains	1964	39,536
Scapegoat	1972	155,529
Mission Mountains	1975	73,877
		1,279,221
Proposed Wilderness		
Glacier National Park		655,700
Wilderness Study Areas		
Hoodoo		75,484
Flint Range		35,268
Middle Fork Continental Divide		302,700
Swan Bunker		60,000
Tuchuck		18,360
Thompson Seton		18,500
Scotchman Peak		16,580
Silver King Falls Creek		9,700
Grizzly Basin		5,500
West Side Swan Monture		102,991
Arrasta Stonewall		9,400
		654,483
Primitive Areas		
Existing		-0-
Montana Wilderness Study Areas 1/		
Sapphire		94,234
Blue Joint		61,544
		155,778
Citizens Interest Areas 2/		
Sheephead		10,000
Burnt Fork, Wyman, Eagle Stoney		60,000
Cataract		16,700
Galena Creek		7,400
Canyon Peak		3,200
Trout Creek		23,040
Little Blackfoot, Cottonwood		20,000
		140,340

TABLE IV-26--EXISTING AND PROPOSED LAND AND RIVER RESERVATIONS (Continued)

Designated Area	
Other Identified Roadless Areas	Acres
	1,600,000
Wild and Scenic Rivers	Miles
Existing	-0-
Proposed Wild and Scenic Rivers	
South Fork of the Flathead	60.1
Middle Fork of the Flathead	100.6
North Fork of the Flathead	58.3
	219.0

Source: River Basin Planning Staff

1/ Montana S. B. 393-1975
2/ Identified by Montana Wilderness Association

The Montana Department of Fish and Game began buying and leasing wildlife winter range in 1948. Since then they have purchased approximately 24,900 acres and leased approximately 43,800 acres.

Wildlife species have specific habitat requirements that range from alpine-rockland and wet marshland to cropland. Maps IV-1 through IV-9 present wildlife habitat information. The following is a description of wildlife species in the basin.

Elk--The elk is a migratory species, moving from high summer mountain areas to open grassland slopes at lower elevation when the accumulated snow forces them down. Winter range is one of the factors limiting herd size and vitality. Elk populations have increased since the 1940's.

Mule and White-tailed Deer--Like the elk, deer migrate from the mountains to the foothills, open lowland slopes, and river bottoms during the fall and winter. Although deer occupy almost all land areas in the basin at some time during the year, only the winter range, which is one of their limiting factors, was mapped. Mule deer, and especially white-tailed deer, distribution has increased to include more areas of the basin since the 1940's, but marked reductions in deer population have occurred since the early 1970's.

Shiras Moose--Moose habitat in the basin ranges from high alpine meadows and swamps to bottomland willow stands. Although moose move from summer to winter range, they do not migrate or herd like elk and deer. Winter range can vary from upland forest, where subalpine fir is a principal food, to willow bottoms. Because of the dispersion aspects of moose, yearly moose habitat was mapped for all seasons rather than delineating only winter range. Moose distribution has increased since the 1940's.

Mountain Goat--Goats are adapted to rugged terrain and use the mountainous areas of the basin. Goats tend to use higher areas in the summer than in the winter, but in some areas herds actually move higher in the winter to utilize open slopes and cliffs. The map for goats shows overall yearly range. Conflicts between mountain goats and man seldom occur due to the general ruggedness of goat habitat.

Rocky Mountain Bighorn Sheep--Bighorn sheep inhabit areas in the basin where there is a good supply of forbs, grasses, and browse in combination with rocky cliff areas for escape. Generally, bighorn sheep use areas of lower elevation than goats, but like goats do not tend to conflict with civilization and the approach of urbanization. The sheep map shows overall range distribution of sheep herds.

Black and Grizzly Bear--Black bear and grizzly bear habitat is mapped together. In most areas their ranges tend to overlap. Grizzlies are generally found only in the remote forest areas away from man's influence, although they sometimes stray into populated areas. Black bear occur in almost all of the forested areas of the basin and during periods of food shortages are common in the population centers.

Pronghorn Antelope--Pronghorn antelope require prairie habitat, which is minimal in the basin, and only two small herds are present. Their habitat was not mapped.

Mountain Lion--Rough, timbered terrain is characteristic mountain lion habitat and a good population of prey animals is required for its survival. Mountain lions usually do not conflict with the land uses of man.

Mountain Caribou--The mountain caribou is considered a peripheral animal in the basin and inhabits only the northern portion of the study area during extreme winters when they are forced south from Canada.

Furbearers and Predators--Animals common in the basin which are classified as furbearers by the Revised Code of Montana, Section 26-201, 1975, include marten, otter, muskrat, fisher, mink, and beaver. Predators include bobcat, coyote, civet cat, weasel, and skunk.

Mountain Grouse--Mountain grouse in the basin are blue grouse, spruce grouse, and ruffed grouse. Blue and spruce grouse habitats were mapped together because of the similarity and overlap of habitat, although the spruce grouse tend to use denser forest types than blue grouse. Ruffed grouse inhabit a smaller area which is located in drainages consisting of deciduous trees, brush, and mixed conifer stands. Most mountain grouse habitat is dependent on open area within the forest and factors such as logging and fire are necessary for ideal habitat.

White-tailed Ptarmigan--The white-tailed ptarmigan is found only in the alpine regions. Because their habitat is above timberline, they are not vigorously observed or studied and little is known of their habits or habitat within the basin. Ptarmigan may be a good indicator of alpine environmental quality.

Ring-necked Pheasant--Typical habitat of the pheasant is cropland and brush intermix that is within or near agricultural areas. Good populations of pheasants occurred in the basin during the 1940's and 1950's due to the large amounts of grain crops and cover available.

Presently, with the shift in land use from cropland to pastureland and the clean farming practices such as cleaning fencerows, burning brush and using pesticides, the pheasant populations have declined.

Gray (Hungarian) and Chukar Partridge--Gray and chukar partridge inhabit dry rolling plains-type hills which surround agricultural areas. Chukar partridge habitat was not mapped due to its restricted area.

Merriam's Turkey--Habitat of the Merriam's turkey is generally restricted to open stands of ponderosa pine in rolling hills country. Turkeys were first transplanted in the basin in 1958 near Florence. Additional transplants occurred near Plains in 1959, east of Superior in 1964, and near Corvallis in 1965. Small flocks have become established on the periphery of the initial planting areas, but the further extension of turkey range in the basin is thought to be limited.

Waterfowl--A wide variety of waterfowl inhabits the basin during the summer and a few ducks and geese winter along open rivers. See table IV-27. Their habitat includes wetlands, glacial potholes, and riparian lands along streams and lakeshores.

Many acres of wetland habitat have been drained in the basin since the advent of agriculture, but in recent time, portions of this loss have been offset by federal and state acquisition and construction programs. Some wetland areas are still being converted to other uses. Loss of wetland areas affects waterfowl production, but other forms of wildlife such as amphibians suffer considerably more by these losses due to their relative nonmobility. (See table IV-28 for amphibians of the area.)

TABLE IV-27--COMMON WATERFOWL
CLARK FORK OF THE COLUMBIA RIVER BASIN

Ducks

- Mallard
- Gadwall
- Pintail
- Green-winged teal
- Blue-winged teal
- Cinnamon teal
- American wigeon
- Northern shoveler
- Wood duck
- Redhead
- Canvasback
- Lesser scaup
- Common goldeneye
- Barrows goldeneye
- Bufflehead
- Harlequin duck
- Ruddy duck

Geese

- Canada goose
- Snow goose
- Ross' goose

Mergansers

- Hooded merganser
- Common merganser

Swans

- Whistling swan
- Trumpeter swan

Others

- American coot
- Sandhill crane
- Common snipe

Source: River Basin Planning Staff

TABLE IV-28--AMPHIBIANS
CLARK FORK OF THE COLUMBIA RIVER BASIN

- Long-toed salamander
- Tailed frog
- Pacific treefrog
- Leopard frog
- Coeur d'Alene salamander
- Western toad
- Spotted frog
- Bullfrog

Source: Montana Department of Fish and Game

Nongame Wildlife--Many forms of nongame wildlife are present in the basin and most are affected to some extent by land-use patterns and human activity. Many nongame species are excellent indicators of the environmental situation. For example, the mourning dove, which is an indicator of good environmental quality, is decreasing. Type

TABLE IV-29--NONGAME MAMMALS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Masked shrew
Vagrant shrew
Northern water shrew
Pygmy shrew
Little brown bat
Yuma bat
Long-eared bat
California bat
Long-legged bat
Say bat
Fringed bat
Big brown bat
Hoary bat
Big-eared bat
Silver-haired bat
Wolverine
Badger
Raccoon
Red fox
Lynx
Yellow-bellied marmot
Hoary marmot
Columbian ground squirrel
Golden-mantled ground squirrel
Yellow pine chipmunk
Rufous-tailed chipmunk
Red squirrel
Northern flying squirrel
Northern pocket gopher
Western deer mouse
Bushy-tailed wood rat
Northern bog lemming
Mountain phenacomys
Red-backed vole
Water vole
Meadow vole
Long-tailed vole
Mountain vole
Rocky Mountain jumping mouse
House mouse
Porcupine
Pika
Snowshoe hare
White-tailed jackrabbit
Mountain cottontail

Source: Montana Department of Fish and Game

TABLE IV-30--NONGAME REPTILES
CLARK FORK OF THE COLUMBIA RIVER BASIN

Painted turtle
Eastern short-horned lizard
Western skink
Northern alligator lizard
Rubber boa
Racer
Bullsnake
Common garter snake
Western garter snake
Prairie rattlesnake

Source: Montana Department of Fish and Game

TABLE IV-31--NONGAME BIRDS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Common loon
Red-throated loon
Red-necked grebe
Horned grebe
Eared grebe
Western grebe
Pied-billed grebe
White pelican
Double-crested cormorant
Great blue heron
Black-crowned night heron
American bittern
Turkey vulture
Goshawk
Sharp-shinned hawk
Cooper's hawk
Red-tailed hawk
Swainson's hawk
Rough-legged hawk
Ferruginous hawk
Golden eagle
Bald eagle
Marsh hawk
Osprey
Gyrfalcon
Prairie falcon
Merlin
Sparrow hawk
Wilson's phalarope
Northern phalarope
Herring gull
California gull
Ring-billed gull
Bonaparte's gull
Common tern
Caspian tern
Black tern
Rock dove
Mourning dove
Screech owl
Great horned owl
Snowy owl
Hawk owl
Pygmy owl
Great gray owl
Long-eared owl
Short-eared owl
Boreal owl
Saw-whet owl
Poor-will
Common nighthawk
Black swift
Vaux's swift
White-throated swift
Black-chinned hummingbird
Broad-tailed hummingbird
Rufous hummingbird
Calliope hummingbird
Belted kingfisher
Common flicker
Pileated woodpecker
Lewis' woodpecker
Yellow-bellied sapsucker
Williamson's sapsucker
Hairy woodpecker
Downy woodpecker
Black-backed three-toed woodpecker
Northern three-toed woodpecker
Eastern kingbird
Western kingbird
Say's phoebe
Traill's flycatcher
Least flycatcher
Hammond's flycatcher
Western flycatcher
Olive-sided flycatcher
Horned lark
Violet-green swallow
Tree swallow
Bank swallow
Rough-winged swallow
Barn swallow
Cliff swallow
Gray jay
Steller's jay
Black-billed magpie
Raven
Common crow

TABLE IV-31--NONGAME BIRDS (Continued)

Clark's nutcracker
Black-capped chickadee
Mountain chickadee
Boreal chickadee
Chestunut-backed chickadee
White-breasted nuthatch
Red-breasted nuthatch
Pygmy nuthatch
Brown creeper
Dipper
House wren
Winter wren
Long-billed marsh wren
Canyon wren
Rock wren
Gray catbird
Robin
Varied thrush
Hermit thrush
Swainson's thrush
Veery
Western bluebird
Mountain bluebird
Townsend's solitaire
Golden-crowned kinglet
Ruby-crowned kinglet
Water pipit
Bohemian waxwing
Cedar waxwing
Northern shrike
Loggerhead shrike
Starling
Solitary vireo
Red-eyed vireo
Warbling vireo
Tennessee warbler
Orange-crowned warbler
Nashville warbler
Yellow warbler
Audubon's warbler
Townsend's warbler
Northern waterthrush
MacGillivray's warbler
Yellowthroat
Yellow-breasted chat
Wilson's warbler
American redstart
House sparrow
Bobolink
Western meadowlark
Yellow-headed blackbird
Red-winged blackbird
Bullock's oriole
Brewer's blackbird
Brown-headed cowbird
Western tanager
Black-headed grosbeak
Lazuli bunting
Evening grosbeak
Cassin's finch
House finch
Pine grosbeak
Gray-crowned rosy finch
Black rosy finch
Hoary redpoll
Common redpoll
Pine siskin
American goldfinch
Red crossbill
White-winged crossbill
Green-tailed towhee
Rufous-sided towhee
Savannah sparrow
Grasshopper sparrow
Vesper sparrow
Lark sparrow
Oregon junco
Tree sparrow
Chipping sparrow
Harris' sparrow
White-crowned sparrow
Fox sparrow
Lincoln's sparrow
Song sparrow

Source: Montana Department of Fish and Game

III and Type IV wetlands are important waterfowl habitat. Types I and II wetlands contiguous with Types III and IV are more important for waterfowl nesting areas than when occurring in isolated areas. See tables IV-29, IV-30, and IV-31 for a listing of nongame mammals, reptiles, and birds which occur within the basin.

Threatened and endangered species are a prime indicator of man's influence upon the environmental quality of an area. Two endangered species--the American Peregrine falcon and the Northern Rocky Mountain wolf--have been documented as being observed in the basin. The grizzly bear, which is currently listed as a threatened species, occupies large portions of the more remote areas.

Water

There is no historical record of water quality in the basin before the coming of white men. It can be assumed, however, that natural erosion caused by changing river channels and sedimentation from areas denuded by fire did occur. The Lewis and Clark expedition (1805-1806) did make mention of the turbid water which they encountered in the mountain section of their journey.

During the late 1800's, the mining and timber industries with resulting practices such as hydraulic placer mining grew rapidly. Deterioration of the water quality accompanied the growth of these industries.

The 1930's and 1940's saw increased use and misuse of the water resource. Increased water use occurred in the agricultural, municipal, and industrial segments. The increase of water withdrawal was especially detrimental to the aquatic resource on small streams and creeks. Some of the smaller tributaries were completely dewatered during the late summer and early fall periods.

Additional deterioration of water quality during the 1930's and 1940's can be attributed to the addition of sewage and wastes to the streams and lakes by municipal and industrial sources. Construction of many new major dams for power generation also occurred during this period.

As with the land resource, the 1930's and 1940's were the beginning of the move to stop sources of water pollution. Communities started construction of sewage treatment facilities and certain industries started constructing settling ponds.

Presently, the quality of the water resources of the basin is generally improving when compared to previous periods. Dewatering of streams for agricultural irrigation and pollution of receiving waters from irrigation return flows have somewhat diminished due to increased sprinkler irrigation. Erosion and sediment production on forested, agricultural, and other lands reduce water quality and water habitat for fish reproduction. Fish and wildlife have been recognized as beneficial users of water under the 1973 Montana water use acts. Municipal and industrial waste water treatment is required by law. According to the Montana Department of Health and Environmental Sciences, several communities in the Clark Fork basin have, or are constructing, sewage facilities capable of meeting secondary sewage treatment standards.

Kalispell, Bigfork, Columbia Falls, Lolo, Galen, and the University of Montana Biological Station at Yellow Bay presently have secondary treatment facilities. Missoula, Butte, Alberton, Stevensville, and

Superior are nearing completion of secondary facilities. Some of these communities have problems with plan operations or the systems in general which prevent their sewage treatment from consistently meeting state and federal secondary treatment standards. Anaconda discharges wastes to the settling ponds of the smelter and treatment is considered adequate.

State law requires compliance with secondary standards "as soon as possible", while federal law requires all communities to comply by July 1, 1977. Other communities working toward compliance with these standards include Darby, Deer Lodge, Drummond, Hamilton, Hot Springs, Charlo, St. Ignatius, Ronan, Thompson Falls, Whitefish, and Warm Springs State Hospital.

Industries in the basin working toward compliance with the 1977 standards include Hoerner-Waldorf Co. in Missoula, Anaconda Co. at Butte and Warm Springs, and Consolidated Dairies at Ronan. Pollution of water is being somewhat abated at the present time.

Reservoirs inundate segments of free-flowing streams and block fish passage. About 98 miles of free-flowing streams have been inundated (see table IV-32). Storage capacity of reservoirs 50 acre-feet or larger in the Clark Fork Basin is 5,460,000 acre-feet. Storage of 22,000 acre-feet was accomplished before the year 1900, was increased by 208,000 acre-feet by the year 1930, and increased by 5,230,000 acre-feet between 1930 and 1970. The largest reservoirs constructed during the last 40 years were Kerr Dam and Hungry Horse Dam, with storage totaling 4,761,400 acre-feet--both being in the Flathead River Basin.

TABLE IV-32--FREE-FLOWING STREAMS INUNDATED BY RESERVOIRS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Name	Stream	Miles of Stream Lost
Bigfork	Swan River	1
Cabinet Gorge	Clark Fork River	14
Como Lake	Rock Creek	3
Dry Fork	Little Bitterroot River	3
E.F. Rock Creek	E.F. Rock Creek	1
Hubbart	Little Bitterroot River	3
Hungry Horse	S. F. Flathead River	32
Kicking Horse	Post Creek Tributary	2
Lower Crow	Crow Creek	2
Lower Willow Creek	Willow Creek	2
Milltown	Clark Fork River	2
Nevada Creek	Nevada Creek	2
Noxon Rapids	Clark Fork River	18
Thompson Falls	Clark Fork River	9
Painted Rocks Lake	W.F. Bitterroot River	4
		98

Source: River Basin Planning Staff

Fish

Fish species are excellent indicators of the deterioration of water quality. For example, the occurrence and distribution of the native westslope cutthroat trout has decreased markedly within the last 50 years. Portions of its former habitat are now occupied with introduced species such as brook trout, rainbow trout, and brown trout.

Fisheries resources of the basin are quite diverse and range from high mountain lakes and streams to lowland reservoirs and rivers. Both cold and warm water fish are found in the area. (See table IV-33 for game and nongame fish.)

There are over 700 ponds, lakes, and reservoirs identified in the study area with a population of game fish present. These ponds, lakes, and reservoirs cover about 231,000 acres (map IV-). Over 20 species of fish occur in these bodies of water. (See Appendix for statistics on individual bodies of water.)

TABLE IV-33--GAME AND NONGAME FISH
CLARK FORK OF THE COLUMBIA RIVER BASIN

Game Fish	Nongame Fish
Lake whitefish	Peamouth
Mountain whitefish	Flathead minnow
Pygmy whitefish	Northern squawfish
Kokanee	Longnose dace
Golden trout	Redside shiner
Cutthroat trout	Longnose sucker
Rainbow trout	Largescale sucker
Brown trout	Black bullhead
Brook trout	Yellow bullhead
Dolly Varden trout	Mosquitofish
Lake trout	Variable platyfish
Arctic grayling	Pumpkinseed
Northern pike	Yellow perch
Smallmouth bass	Slimy sculpin
Largemouth bass	Shorthead sculpin

Source: Montana Department of Fish and Game

The basin contains about 98 miles of class 1 blue ribbon streams, 411 miles of class 2 streams, 833 miles of class 3 streams, and 1,074 miles of class 4 streams. (See map IV- .) There are several thousand miles of streams with game fish populations present which have not been classified under the present fisheries class system.

Air

An old Indian story is told that relates how Indians standing near the Jocko divide observed a temperature inversion layer of smoke. Thereafter they referred to the Missoula valley as the "Sea of Dead

Air." Air pollution from forest fires was common before the arrival of white men. The Indians sometimes burned large areas intentionally to drive game out of cover and so that the new grass in the spring would attract game.

During the late 1800's and early 1900's, air quality decreased considerably with the increased industrialization of the basin. Smelters for reduction of mine ores and increased forest fires added to this deterioration. Steam locomotives which ran principally in the valley bottoms released smoke and cinders. Some cinders are still visible in the soil profiles near railroad tracks.

The 1930's and 1940's saw an increase in industrialization and a related increase in air pollution. Smelters of the mining industry, teepee burners of the wood industry, and slash burning of the forest industry were all common. In addition, the increase in automobiles had started to add pollution to the air. The beginning of air pollution control emerged during the mid 1900's. Intensive forest fire control was initiated and environmental awareness was awakening.

At present the air quality of the basin is improving in some aspects, but decreasing in others. The wood waste teepee burners from the timber industry are mostly phased out, but other pollutants such as sulphur dioxide, carbon monoxide, and fluoride are still present, but are decreasing due to enforcement of air quality standards. Emissions from automobiles continue to increase with the ever-increasing numbers of these vehicles.

Several industries do not currently meet air quality standards in western Montana. These industries are each on compliance schedules under order of the Montana Department of Health and Environmental Sciences and must comply with the schedule on the date listed below.

Stauffer Chemical, Rocker, March 1978
Anaconda Company, Anaconda, July 1977
U. S. Plywood, Bonner, May 1976
Intermountain Lumber, Missoula, July 1977
Louisiana Pacific (Evans Products), Missoula, October 1977
Anaconda Aluminum, Columbia Falls, July 1979

In addition, Diamond International at Superior, Del Connor Lumber at Darby, and several other minor sources of air pollution have been encouraged to reduce emissions, but are not yet under any schedule to comply.

Relationship Between Environmental Situations and EQ Specific Components

The present environmental condition in the basin has prompted the public in their definition of problems. The specific component objectives which are addressed in chapter III relate directly to the problems. If the public were completely satisfied with the present environmental situation, the 16 specific component objectives listed in chapter III would not be necessary. The desires of the public cannot be met immediately. Therefore, the dissatisfaction is translated into the desired achievements for environmental improvements expressed later in this chapter. Wise management and use of the environmental resources can help maintain the high quality environment in the basin and meet each of the specific components.

PROJECTIONS

A large number of forces influence economic activity and long-term economic growth. None of these forces can be considered as fixed.

Furthermore, these forces vary in their relative influence over time. Changing incomes, shifting tastes, development of substitute products, and changing prices tend to modify trends. Substitute products cause changes in use patterns. The expansion of world markets affects the agricultural industry of the United States and its various regions.

It is impossible to project accurately the influence that each of the above factors will have in the economy of the future. We do, however, attempt to assess the results of the above-mentioned forces. The resulting projections are not predictions of future levels of production but, rather, they are approximations of what may occur if a specific set of assumptions are, in fact, to happen.

General Methodology

The OBERS Series E projections were selected as a baseline projection for the study area. 1/ The baseline concept, in simplest terms, means that a particular set of projections is selected as a base against which all other projections are compared or analyzed as alternatives. They should not, however, be viewed as quotas that must be met in the case of projections of food and fiber.

The 1972 OBERS projections contain estimates for 20 major water resource regions and 205 subareas which have been designated, in addition to estimates by states. Water Resources Subarea (WRSA) 1702 conforms to the study area if two counties, one in Idaho and one in Washington, are excluded. The Montana portion of WRSA 1702 is the Clark Fork study area. This study area, for purposes of analysis and presentation of data, was further disaggregated into three smaller subareas, as designated in other sections of this report.

1/ Water Resources Council projections.

The OBERS population projection Series C was adjusted for use in the Clark Fork study area and its subareas, using the following methodology. The Clark Fork study area has experienced a more rapid rate of population growth than has Bonner and Pend O'Reille Counties, two counties not in the Clark Fork study area, but included in WRSA 1702. A trend line was calculated for each economic subarea, based upon the decennial census years 1930-1970. The trend line was extrapolated throughout the projection period 1990-2020.

The employment projections were formulated by extending the employment to population ratios from the historic base into the future. Usually growth in population due to in-migration is a function of employment opportunities, except in a few areas which attract an especially large number of retired persons and recreational home sites. The Flathead subarea seems, in some degree, to characterize the latter type of growth.

The methodology for projecting personal income was similar to that for population and employment. In 1970 there was not a wide divergence in personal per capita income among the subareas of the Clark Fork study area. Per capita personal income ranged from $2,980 in the Flathead subarea to $3,111 in the Upper Clark Fork, as measured in current dollars--a difference of only $131. This relative uniformity in per capita income suggests that, by applying the OBERS rate of increase for WRSA 1702 to the 1970 personal income figures, a projection for the study area could be obtained which is consistent with the OBERS framework and adequate for planning purposes.

Projections for food and fiber were estimated for the Montana portion of WRSA 1702, which conforms to the Clark Fork study area. For a projection of requirements or demand, there is no attempt to provide a further disaggregation for the subareas of the Clark Fork study area.

Desired Future Economic Projections--OBERS

General Assumptions

The general assumptions that underlie the OBERS Series C projections are as follows:

1. Growth of population will be conditioned by a decline of fertility rates from those of the 1962-1965 period.
2. Nationally, reasonably full employment, represented by a four-percent unemployment rate, will prevail at the points for which projections are made; as in the past, unemployment will be disproportionately distributed regionally, but the extent of disproportionality will diminish.
3. No foreign conflicts are assumed to occur at the projection dates.
4. Continued technological progress and capital accumulations will support a growth in private output per man-hour of three percent annually.
5. The new products that will appear will be accommodated within the existing industrial classification system.
6. Growth in output can be achieved without ecological disaster, although diversion of resources for pollution control will cause changes in the industrial mix of output.

The subarea projections are based on the following additional assumptions:

1. Most factors that have influenced historical shifts in regional "export" industry location will continue into the future with varying degrees of intensity.
2. Trends toward economic area self-sufficiency in local service industries will continue.
3. Workers will migrate to areas of economic opportunities and away from slow-growth or declining areas.
4. Subarea earnings per worker and income per capita will continue to converge toward the national average.
5. Subarea employment/population ratios will tend to move toward the national ratio.

OBERS Projected Population

The OBERS projections of population are based upon the Series C projections issued by the Census Bureau in 1970. The fertility rate per 1,000 women in that series is projected to be a substantial decline from the 1962-1965 level. In spite of the declining fertility rate, Series C projections call for an approximate doubling of the national population between 1968 and the year 2020.

The population of the Clark Fork study area is projected to increase from 203,618 in 1970 to 284,465 in 2020 (table 34). This represents an increase of 40 percent over the 50-year period. The study area is projected to increase in population at a more rapid rate than the state generally. Average annual increase for the study area is about one-quarter of one percent for the 50-year period 1970-2020.

Projected Employment

The long-term employment trends for the study area have an important bearing on the projected economic growth of a region or area. Employment projections for the study area are presented in table 35. Employment in the study area is projected to increase from 69,000 in 1970 to 106,000 in the year 2020--an average annual growth rate of about nine-tenths of one percent.

The Lower Clark Fork subarea is projected to experience the highest percentage increase in employment for the 1970-2020 time period, with a 100 percent increase. Although the Flathead subarea is projected to have the smallest percentage of its population employed, it is projected to experience a 59 percent increase in employment by 2020. The projected decrease for the Upper Clark Fork for the same period is about 21 percent.

Projected Income

Projections of income indicate, to some degree, the study area's potential as a consumer market and somewhat of a measure of the ability of an area to support public service expenditures.

The OBERS projections of personal income are stated in 1967 dollars. The 1970 data for the study area were adjusted to 1967 dollars to provide the base from which the extensions were made.

Personal income for the Clark Fork study area is projected to increase from approximately $544.8 million in 1970 to $3.7 billion in 2020, as

TABLE IV-34--PROJECTED POPULATION GROWTH, BY SUBAREA, WITH COMPARISONS 1970, 1990, 2000, and 2020

Item	1970	1990	2000	2020
	- - - - - - -	- number -	- - - - - -	- - -
Flathead	54,000	66,000	70,000	81,000
Lower Clark Fork	83,000	105,000	116,000	151,000
Upper Clark Fork	67,000	61,000	60,000	52,000
Total Clark Fork Study Area	204,000	232,000	246,000	284,000
Total WRSA 1702	225,000	256,000	272,000	314,000
Montana	694,000	755,000	790,000	902,000

Based on OBERS Series C population projections.

TABLE IV-35--TOTAL AND BASIC EMPLOYMENT, BY SUBAREA, WITH COMPARISONS 1970 AND PROJECTED 1990, 2000, AND 2020

Item	1970	1990	2000	2020
	- - - - - - -	- number -	- - - - - -	- - -
Flathead				
Total	17,000	21,000	22,000	27,000
Basic	7,100	8,700	9,100	11,200
Lower Clark Fork				
Total	29,000	39,000	44,000	60,000
Basic	12,600	16,900	19,000	26,000
Upper Clark Fork				
Total	23,000	22,000	21,000	19,000
Basic	11,200	10,700	10,200	9,300
Clark Fork Study Area				
Total	69,000	82,000	87,000	106,000
Basic	30,900	36,300	38,300	46,500

Based on OBERS Series C population projections.

measured in constant 1967 dollars. This expansion represents an average annual increase over the 50-year period of 3.9 percent. This long-term rate is slightly higher than the rate projected for the state--3.5 percent over the same period (table IV-36).

Per capita income is projected to increase at a slightly lower average annual rate for the 50-year period--3.2 percent in the study area--compared with 3.0 percent for the state overall. The highest rate of expansion is projected for the period 1970-1980, after which the rate of increase slackens somewhat.

Projected Demand for Food and Fiber

For the Clark Fork study area, small grains production is projected to continue its relative importance (table IV-37). Wheat, oats, and barley production will increase significantly throughout the projection period. The projection, based on historic shares of national production, results in a projected increase in sugar beet production for the study area. Actually, the future of this crop is very uncertain in the Clark Fork.

Hay crops for an expanding livestock industry are projected to increase production 123 percent over the projection period. Red meat production is projected to increase over 150 percent. Lamb and wool production shows a halt to a declining trend and attains a modest increase of 13 percent. Production of dairy products in the study area is projected to decline.

TABLE IV-36--PERSONAL INCOME, TOTAL AND PER CAPITA, BY SUBAREA 1970 AND PROJECTED 1990, 2000, AND 2020 (1967 CONSTANT DOLLARS)

CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	1970		1990		2000		2020	
	Per Capita	Total	Per Capita	Total	Per Capita	Total	Per Capita	Total
	dollars	1,000 dollars	dollars	1,000 dollars	dollars	1,000 dollars	dollars	1,000 dollars
Flathead Subarea	2,637	142,147	5,594	370,522	7,136	499,520	12,930	1,047,330
Lower Clark Fork	2,639	218,306	5,599	587,895	7,142	828,472	12,941	1,954,091
Upper Clark Fork	2,752	184,356	5,838	356,118	7,447	446,820	13,493	701,636
Total Clark Fork Study Area	2,676	544,809	5,666	1,314,535	7,214	1,774,812	130,040	3,703,057

Based on OBERS Series C projections.

TABLE IV-37--AGRICULTURAL PRODUCTION, BY COMMODITY GROUPS, CURRENT NORMAL AND PROJECTED 1980, 2000, AND 2020

CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Unit	Current Normal	1980	2000	2020
		- - - - - - - - - -	- - thousands	- - - - - - - -	- -
Wheat	bu.	1,[illegible].5	2,963.1	3,206.9	3,601.0
Rye	bu.	[illegible]	3.8	3.6	3.2
Corn for silage	tons	18.2	45.1	53.8	72.4
Oats	bu.	488.3	1,520.1	1,687.4	1,931.3
Barley	bu.	2,248.7	3,186.4	3,737.0	4,674.3
Fruit--non-citrus	tons	4.9	0.5	0.2	0.2
Vegetables	cwt.	[illegible].8	10.9	7.8	3.4
Sugar beets	tons	1[illegible].6	5[illegible].8	66.1	96.9
Irish potatoes	cwt.	1,011.8	683.5	683.9	690.8
Hay crops	tons	672.8	821.2	934.6	1,543.5
Beef and veal	lbs/lwt.	1[illegible]8,[illegible]70.7	179,072.2	206,217.3	279,828.4
Pork	lbs/lwt.	10,[illegible]4.8	14,487.1	16,657.1	21,977.4
Lamb and mutton	lbs/lwt.	1,432.[illegible]	1,539.7	1,558.5	1,632.4
Replacement chickens	lbs/lwt.	1,370.3	745.2	583.5	372.9
Eggs	number	50,00[illegible].[illegible]	47,5[illegible].4	46,000.0	42,000.5
Milk	pounds	152,000.[illegible]	78,50[illegible].8	67,000.0	50,000.0

Current normal data from Montana Agricultural Statistics, 1966, 1969, 1970, and U. S. Census of Agriculture, 1969. Projections from unpublished material supporting the agricultural portion of the Water Resources Council OBERS projections, Series C.

Alternative Economic Projections

General Assumptions

The general assumptions underlying the OBERS Series C projections are essentially adequate for this study. Likewise, the assumptions for subarea projections are generally adequate. However, when the OBERS disaggregated commodity, employment, and earnings figures are closely examined, many inconsistencies appear which do not reflect historical trends and economics of the basin. The following discussion attempts to develop alternative figures for farm commodity items, irrigated areas, and reasons for the modification.

Projected Demand for Food and Fiber

The OBERS projections do not appear accurate in their projections of agriculture (including forestry) for the basin. Oats will not increase significantly throughout the projection period because of climatic and economic limitations. Sugar beet production will disappear. Fruit and potato production will probably not decrease as projected by OBERS, but will more than likely stabilize. Milk production is not anticipated to drop, but will stabilize near current levels.

With the changes in the assumptions that the Clark Fork basin will not produce large supplies of dryland crops such as wheat, it is reasonable to assume that the projected level of red meat production (beef, veal, pork, lamb, and mutton) will require additional irrigated crops such as hay. See table IV-38 for modified projections of farm commodities.

TABLE IV-38--AGRICULTURAL PRODUCTION, BY COMMODITY GROUPS, CURRENT NORMAL AND MODIFIED PROJECTIONS 1990, 2000, AND 2020

CLARK FORK OF THE COLUMBIA RIVER BASIN

Item	Unit	Current Normal	Modified Projections 1990	2000	2020
		- - - - - - - - - - -	thousands	- - - - - - - - -	
Wheat	bu.	1,965.5	2,963.1	3,206.9	3,601.0
Rye	bu.	1.5	3.8	3.6	3.2
Corn for silage	tons	18.2	45.1	53.8	72.4
Oats	bu.	488.3	490.0	490.0	490.0
Barley	bu.	2,248.7	3,186.4	3,737.0	4,674.3
Fruit--non-citrus	tons	4.9	5.0	5.0	5.0
Vegetables	cwt.	22.8	10.[illegible]	7.8	3.4
Sugar beets	tons	12.6	-0-	-0-	-0-
Irish potatoes	cwt.	1,011.8	1,012.0	1,012.0	1,012.0
Hay crops	tons	672.8	1,059.0	1,192.0	1,544.0
Beef and veal	lbs/lwt.	108,370.7	179,072.2	206,217.3	279,828.4
Pork	lbs/lwt.	10,054.8	14,487.1	16,657.1	21,977.4
Lamb and mutton	lbs/lwt.	1,432.3	1,539.7	1,558.5	1,632.4
Replacement chickens	lbs/lwt.	1,070.3	745.2	583.5	372.9
Eggs	number	50,000.0	47,500.4	46,000.0	42,000.5
Milk	pounds	152,000.0	152,000.0	152,000.0	152,000.0

Current normal data from Montana Agricultural Statistics, 1968, 1969, 1970, and U. S. Census of Agriculture, 1969. Projections from unpublished material supporting the agricultural portion of the Water Resources Council OBERS projections, Series C and adjusted for observed trends.

The Montana Department of Natural Resources and Conservation (MDNR&C) developed alternative projections for new irrigation that differ radically from those based on OBERS. MDNR&C has identified 1,200,000 acres of arable land in the Clark Fork basin through its land classification program. Based on trends in the growth of irrigation in the past, future irrigation growth could vary from 104,000 acres (based on growth of red meat produced statewide between 1930 and 1972, a 43-year period) and 315,000 acres (based on growth of red meat produced statewide between 1963 and 1972, a 10-year period).

The Department used the same assumption as OBERS for red meat production in the State of Montana, but felt that the limited amount of irrigated land projected to meet that production by OBERS was not adequate. The alternative projection then assumed a higher level of irrigation growth (155,500 acres), based on past trends in red meat production (statewide) from 1948 to 1972, a 25-year period. Allocations of the acreages, from a statewide projection to river basin areas, were made on the basis of the percentage of historical red meat production. As an example, 10 percent of the state's livestock was produced in the Columbia River Basin in 1970. Further disaggregation of acreages to smaller subareas was made on the basis of available land capable of sustaining extensive irrigated agriculture. While these acreages have not been specifically identified, an adequate water supply is assumed to be available to develop these lands. Table IV-39 illustrates these "new irrigation" projections.

While the forest resource in the basin is decreasing, the OBERS projection for timber is considerably lower than that which the basin is capable of producing with accelerated forest thinning on reforestation.

TABLE IV-39--PROJECTED NEW OR ADDED IRRIGATED AREA
CLARK FORK OF THE COLUMBIA RIVER BASIN

	1970-1980	1981-2000	2001-2020	Total
	- - - - - - - - - - -	- - - acres - - -	- - - - - - - - - - -	
Montana				
Series C	68,000	21,000	29,000	118,000
Alternative	315,800	631,600	631,600	1,579,000
Columbia Basin (in Montana)				
Series C	23,000	7,000	10,000	40,000
Alternative	32,800	65,600	65,600	164,000
Clark Fork Study Area				
Series C	21,000	7,000	9,000	37,000
Alternative	31,100	62,200	62,200	155,500
Upper Clark Fork Subarea				
Series C	2,000	1,000	1,000	4,000
Alternative	12,300	24,600	24,600	61,500
Lower Clark Fork Subarea				
Series C	5,000	2,000	2,000	9,000
Alternative	9,000	18,000	18,000	45,000
Flathead Subarea				
Series C	14,000	4,000	6,000	24,000
Alternative	9,800	19,600	19,600	49,000

While wilderness and other reserved areas may continue to remove commercial timber lands from availability, OBERS has projected only a portion of the production which the basin is capable of providing with accelerated forest land treatment measures.

Outdoor Recreation Projections

Outdoor recreation activity occasions are projected to increase from 14.9 million to 21.9 million by 1990 and to 36.2 million by the year 2020 for the 16 activities as shown in table IV-40. These projections were made by the Recreation Data Subcommittee of the Pacific Northwest River Basin Commission and are based on OBERS Series "C" population projections and three rates of growth in per capita participation.

TABLE IV-40--OUTDOOR RECREATION PROJECTIONS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Activity	Rate of Growth	1970[1]	1990	2020
		Thousands of Activity Occasions		
Camping	Slow	1,682	2,551	4,217
Picnicking	Slow	724	1,187	1,928
Swimming	Rapid	272	481	925
Sightseeing and driving for pleasure	Slow	5,040	7,360	12,169
Fishing	Stable	642	731	914
Boating	Rapid	249	443	843
Water skiing	Rapid	97	185	376
Walking and hiking		1,501	2,117	3,191
Hunting	Stable	377	430	557
Playing outdoor games	Rapid	477	816	1,517
Bicycling	Rapid	408	724	1,382
Golfing	Rapid	80	149	292
Horseback riding	Slow	164	231	363
Attending outdoor sporting and/or culture events	Slow	1,535	1,909	3,213
Snow activities	Rapid	524	938	1,833
Other	Slow	1,096	1,618	2,455
Total	XXX	14,868	21,870	36,175

Source: Recreation Committee, Pacific Northwest River Basin Commission

[1] Many of these activities were tabulated on weekend use only.

One of the outstanding trends in nonurban areas is the pronounced shift to dispersed recreation activities. Today's recreationist is no longer content, if he ever was, with only the developed recreational facilities. While these existing facilities are used, especially those associated with water-oriented activities, the recreationist is expanding his horizon and now roams far and wide on the public lands in search of new opportunity. The key to this new phenomena is the mobility and self-sufficiency of the user. A mobile and self-sufficient outdoorsman is a discriminating user and facilities not to his liking will be bypassed in favor of more attractive areas in the county or in the next forest. Little development is actually needed in many instances. So phenomenal is this increase and so varied and dispersed is the activity that it is impossible to measure or describe it with any accuracy. If the trend continues, new types of services will be needed and some traditional services will have to be deemphasized.

Forest Products Projections

The national demand projections for industrial roundwood disaggregated to this river basin calls for a 24 percent increase by 1990 and a 60 percent increase by 2020 in annual harvest volume over what it was in 1970. In absolute terms, these projections call for 151.1 million cubic feet in 1990 and 194.6 million cubic feet in 2020 as compared with 121.8 million cubic feet harvested in 1970. Most of the projected demand is saw and veneer logs (large-diameter trees). Demand for pulpwood will increase from 0.7 million cubic feet in 1970 to 5.9 million cubic feet in 1990 and to 16.6 million cubic feet in 2020. The demand for other roundwood, such as posts and poles, will remain relatively constant. See table IV-41. Employment projections in related forest products, paper products, and forest management are also shown in that table for 1990 and 2020 as compared with 1970 employment. Total forest-related employment is projected to increase from 6,615 man-years in 1970 to 7,840 in 1990 and to 8,340 in 2020 if projected demand in roundwood harvest is met.

TABLE IV-41--PROJECTED ROUNDWOOD HARVEST AND RELATED EMPLOYMENT
CLARK FORK OF THE COLUMBIA RIVER BASIN

OBERS Items	1970	1990	2020
	- million cubic feet -		
Roundwood Harvest			
Saw & veneer logs	119.1	143.0	175.4
Other roundwood	2.0	2.2	2.6
Pulpwood	0.7	5.9	16.6
All Roundwood	121.8	151.1	194.6
Employment	- - - man-years - - -		
SIC 24 1/	5,339	5,900	5,340
SIC 26 1/	336	550	920
Forest Management	940	1,390	2,080
Total Employment	6,615	7,840	8,340

Source: River Basin Planning Staff

1/ Standard Industrial Classification (SIC) Bureau of Census Group 24 includes wood products except furniture and paper products; Group 26 includes paper and allied products.

Aquaculture Projections

Projections of future aquaculture production have not been made, but it is assumed that demand will grow at least at the national population growth rate. Commercial fish production in the basin grew fourfold between 1974 and 1976 and larger growth is anticipated with the establishment of a processing plant and wholesale outlets.

Factors affecting future aquaculture growth, particularly the commercial industry are:

1. Availability of artesian wells or springs or alternative costs of pumping water.
2. Economics of compliance with federal and state regulations on treatment of effluent.
3. Economics of new technologies and management practices affecting efficiencies.

Electrical Power Projections

The Power Planning Committee of the Pacific Northwest River Basin Commission projected demands and supplies of electrical energy for the PNWRBC area through 1996. The western Montana share of those projected power needs is about 6.7 percent or 3,200 peak megawatts in 1990 as compared with 1,550 peak megawatts in 1976. Total electrical energy consumption in western Montana is projected at 18,100 million kilowatt hours in 1990 as compared with 8,920 mkwh in 1976. These figures may be conservative if there is massive conversion to electrical heating following Canada's moratorium on crude oil and natural gas export to the United States.

Relationship of National Projections to Specific Components of the Objectives

The projections of population increases under OBERS level "C" assumptions provide a baseline of demands for food, fiber, living space, services, and recreational opportunities. These national demands were disaggregated to the basin on the basis of historical shares of national production of food and fiber and population growth trends in the basin. If the economic projections are to be met, the following changes in component objectives are required.

(1) In order for population to increase, there must be a corresponding increase in basic employment in order to maintain a stable viable economy. Extractive basic employment in mining, agriculture, and forestry is declining and other sources of basic employment must be found to bring outside money into the basin. A total of 36,300 basic employment man-years is required for 1990, and 46,500 basic employment jobs will be required to support 2020 populations.

(2) By 1990 about _________ acres will still be flooded occasionally.

(3) Additional agricultural production and improved efficiency from ___________ acres now having high water table problems.

(4) Additional crop production and improved efficiency on _________ acres now irrigated, requiring _________ acre-feet of late-season water.

(5) By 1990 about _____ small towns and _______ cities will require improved water delivery systems and dependable supplies.

(6) Phase out unused recreational facilities on public land and replace them with the types of facilities the public will use.

(7) Provide all needed urban recreational facilities as quickly as local funds become available. Estimated cost of these facilities is $1,742,000.

(8) No additional private recreational developments are required, as evident by current underuse of existing facilities. Additional technical assistance for improvement of existing facilities will be needed by 1990.

(9) Increase access to public lands at 39 locations and increase fishing access at 61 locations by 1990.

(10) Improve recreation dispersion by providing improved boating facilities on 11 fluctuating reservoirs.

(11) Improve production efficiency through land treatment practices on 475,000 acres of cropland; 1,000,000 acres of range; and 4,200,000 acres of commercial forest.

(12) Protect about 84,000 acres of "other" land from erosion.

(13) By 1990 about 23.9 million more cubic feet of sawlogs and veneer logs will be needed to meet the basin's share of national demand.

(14) In addition, use about 5.4 million cubic feet of lower quality wood, now going unused or wasted.

(15) More complete manufacture of wood products will be needed in the basin to provide additional basic employment.

(16) Additional generation or importation of 9,180 million kilowatt hours of electricity will be needed by 1990 as compared with 8,920 million kwh used in 1976. 1/

1/ Based on the basin's share of projected power requirements shown in Review of Power Planning in the Pacific Northwest, by the Power Planning Committee, Pacific Northwest River Basins Commission, March 1976.

Desired Future Environmental Conditions

Assumptions:

The desired future environmental conditions for this area are very difficult to quantify and qualify due to numerous public opinions. Generally, the public indicated that it wanted improvement in the environmental quality as long as the maintenance of the quality does not become a hardship on individual economic gains.

In a basin abundant in natural resources, it is sometimes difficult to define land and water requirements in specific terms. The ultimate need is for responsible land use and water management to assure preservation or enhancement of the quality environment of the basin. Such things as water quality improvements, flood damage reduction, and improved land management would all greatly benefit the environment.

Desired Achievements:

Erosion and Sediment Control

(1)(2) Erosion and sediment control is needed to protect both land and water resources. The public recognizes that certain amounts of erosion and sedimentation are a natural part of the environment and would be very costly to control, but it wishes to control the increased erosion and sedimentation caused by human activities. Many of these erosion sources are due to land use changes and can be controlled by proper management practices. Erosion and sedimentation control is needed on 173,000 acres of cropland; 1,000,000 acres of rangeland; 84,000 acres of other lands; 62,000 acres of forest land; and 52 miles of streambank along the upper Blackfoot and Little Bitterroot Rivers. Within the National Forest, 2,500 miles of eroding forest trails, roads, and gullies also should be treated.

Sewage and Industrial Waste Treatment

(3) Existing legislation has shown that there is a strong desire to stop the discharge of sewage and industrial wastes to water of the area. This legialation requires complete treatment of all waste discharges by 1983.

Irrigation Water Control

(4) The 1972 water pollution control amendments express a public desire to eliminate pollution from agricultural land. Irrigation water control is desired to eliminate the addition of chemicals, nutrients, and increased water temperatures from agricultural land. Irrigation water control is needed on ____________ acres by 1990.

Air Pollution Control

(5) Montana state regulations provide air pollution control standards. Future environmental quality dictates continued reduction of air pollution at the eight sites identified in the study. Some persons desire a no-pollution aspect by 1990.

Reservoir Control

(6)(13) This practice is addressed to two specific components identified in chapter III. Reservoirs should be operated to eliminate seasonal exposure of mudflats on four reservoirs to improve natural beauty and enjoyment by maintaining additional water during the late summer and fall periods. Reservoir control at Hungry Horse might include a variable depth water discharge to minimize temperature changes and a reregulation reservoir downstream from the dam to minimize water level fluctuations.

Riparian Vegetation Protection and Management

(7) It is desirable to maintain 41,000 acres of riparian vegetation along lakeshores and streams. Loss of the majority of the present riparian vegetation is due mainly to residential encroachment and agriculture. Protection of this vegetation may be accomplished by purchase, easement, management, zoning, or any combination of these practices.

Additional Access to Public Lands

(8) Development of 39 additional access sites to public land is desired to spread access use so that no sites are overused to the extent that they detract from the natural beauty of the areas which they serve.

Controlled and Managed Land Uses

(9) This specific component is desired to minimize damage to open and green space and natural beauty in general. Land use control and management would cover items such as subdivision, timber harvest methods, and clean agricultural methods. It is estimated that these management controls would be needed on all lands in the basin.

Preservation of Free-Flowing Streams

(10) Free-flowing streams are preferable from a natural beauty standpoint. Preservation of all present free-flowing streams would eliminate impoundment and should probably be accomplished by reservation aspects such as scenic and wild rivers designation.

Road and Utility Line Planning

(11) This specific component deals with structures which are considered by many to be an infringement upon the natural beauty of an area. Control of all road and utility line location and construction in the future could require their location in areas which are relatively hidden from view and constructed to minimize effects on the natural beauty of the area.

Minimum Streamflows

(12) Aquatic resources should be protected to meet future environmental desires. In order to protect this resource, minimum streamflows on 2,516 miles of stream need to be maintained. Programs should deal first with those streams which are being dewatered due to water consumption for offstream use.

Wildlife Habitat

(14) This specific component deals with the problem as stated in chapter III of decreasing numbers of wildlife. The desired environmental future is to have maximum numbers of wildlife within the carrying capacity of the land. About 1,350,000 acres of big game winter range and 16,400 acres of upland habitat in and around the agricultural areas are desired by 1990. ____________ acres of wetland habitat types I, II, III, and IV should be protected from drainage.

Fish Passage

(15) It is desirable in the future to maintain natural populations of reproducing fish. In order to accomplish this, barriers such as

Bigfork dam must be circumvented with an operating fish ladder to pass fish during migration periods. No further fish barriers should be installed in any stream in the future unless they are designed for fish management purposes. Existing culverts and bridges which obstruct fish passage should be modified.

Historical and Archeological Sites

(16) There are 443 identified sites in the basin and 12 sites have been designated for preservation.

Relationship to Economic Projections

The desired future environmental conditions of the basin have various relationships with the OBERS projections for the same area.

OBERS projected that the population of the basin will increase by 80,847 between 1970 and 2020. This increase in population will conflict somewhat with the desired future environmental conditions in that these additional persons will be competing for goods, services, and recreational areas from the decreasing resource base. However, improved management of the resources could allow increased use by many more persons without serious degradation. The economic projection section also forecasts an increased use of _________ acres of land for agricultural purposes, of which __________ acre-feet would be depleted. Additional withdrawals of water for agricultural, municipal, and industrial purposes may have adverse effects upon streams, lakes, and their associated aquatic systems. Use of additional acreage for agricultural purposes will often conflict with critical habitat needed for wildlife.

CHAPTER IV--SUMMARY TABLE--ECONOMIC PROJECTIONS AND ENVIRONMENTAL PREFERENCES

Principal Objective	Item	Unit	Desired Futures		
			1970	1990	2020
NED	Population	Nos			
	Tot. Employment	Nos			
	1. Basic Employment	Nos			
	Per Capita Income	Dollars			
	2. Reduce flood damages				
	on agricultural	Acres			
	residential	Acres			
	3. Drain wetlands				
	Class I & II	Acres			
	4. Provide supplemental irrigation water	Acres	208,000		
		Ac-Ft			
	5. Provide adequate				
	municipal water for	Nos			
	towns, cities	Nos			
	6. Provide a balance of recreation facilities				
	7. Provide adequate	Picnic tables	XXX	0 more	13 more
	urban recreational	Golf courses		14	0 more
	facilities	Baseball fields		14	0
		Outdoor bsktb. cts.			
		Tennis courts			
		Outdoor swimming			
		Wading pools			
		Meeting rooms			
		Playgrounds			
		Gymnasiums			
		Craft rooms			
		Handball courts			

CHAPTER IV--SUMMARY TABLE--ECONOMIC PROJECTIONS AND ENVIRONMENTAL PREFERENCES (Continued)

Principal Objective		Item	Unit	Desired Futures		
				1970	1990	2020
NED (Continued)	8.	Improve income in private recreation				
	9.	Provide additional public access points:				
		Lands	Nos.	39	39	39
		Streams	Nos.	61	61	61
	10.	Provide boating facilities for reservoirs	Nos.	11	11	11
	11.	Improve production and efficiency				
		Land Treatment				
		Cropland	Ac.			
		Rangeland	Ac.			
		Commercial forest	Ac.	4,200,000	4,200,000	4,200,000
	12.	Protect other lands from erosion	Ac.			
	13.	Provide more sawlogs	Million Cu.-Ft.	XXX	23.9	56.3
	14.	Use more existing wood	Million Cu.-Ft.		5.4	16.5
	15.	Encourage more complete manufacture of wood products	Man-days	XXX	All possible	All possible

CHAPTER IV--SUMMARY TABLE--ECONOMIC PROJECTIONS AND ENVIRONMENTAL PREFERENCES (Continued)

Principal Objective	Item	Unit	Desired Futures 1970	1990	2020
NED (Continued)	16. Provide firm electric supply	MGW			
NED Projected Development	OBERS:				
	Food & Fiber				
	Wheat	Bu.			
	Barley	Bu.			
	Hay	Tons			
	Irr. land	Acres			
	REVISED OBERS:				
	Wheat	Bu.			
	Barley	Bu.			
	Hay	Tons			
	Pasture	AUM's			
	Irr. land	Acres			
	STATE:				
	Wheat	Bu.			
	Barley	Bu.			
	Hay	Tons			
	Pasture	AUM's			
	Irr. land	Acres			

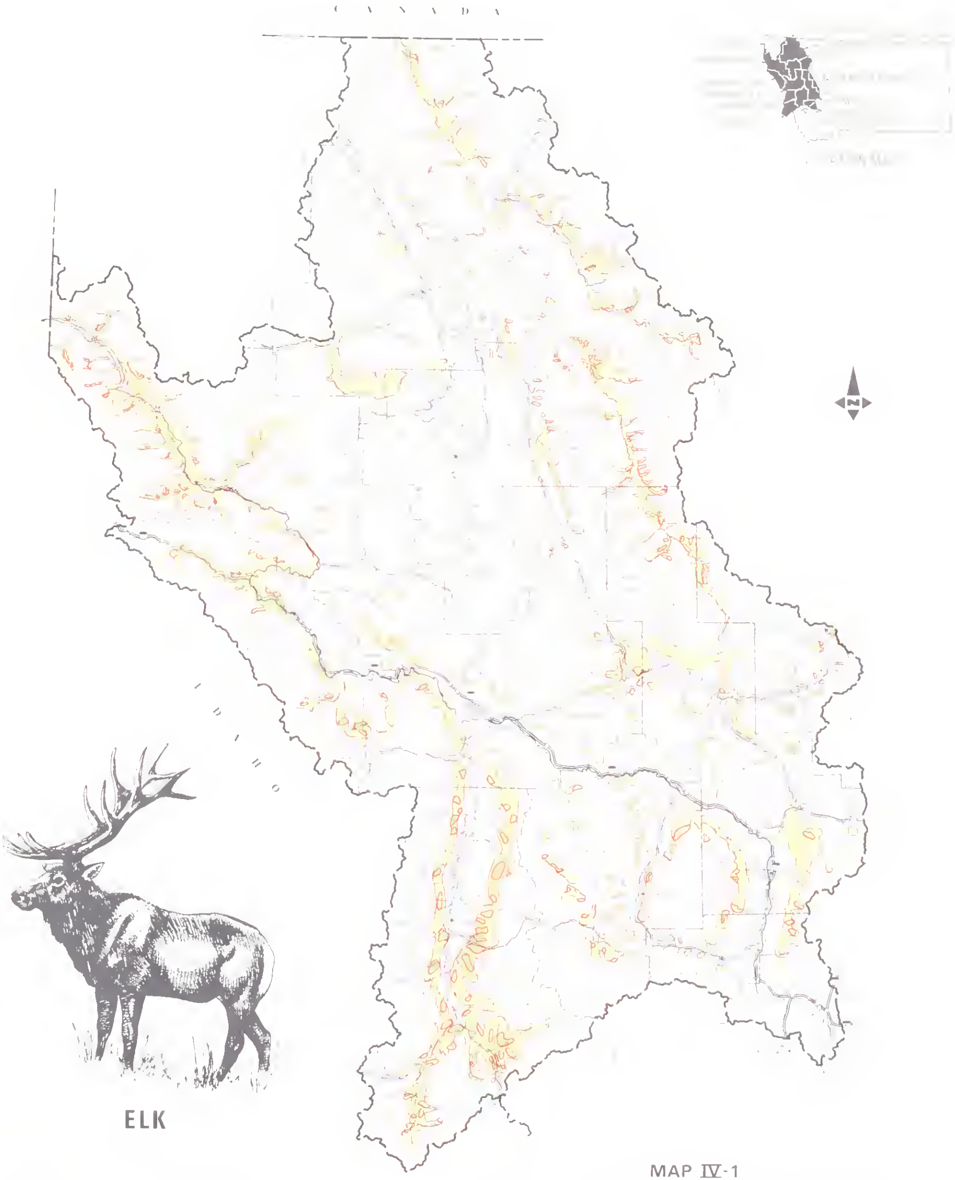
CHAPTER IV--SUMMARY TABLE--ECONOMIC PROJECTIONS AND ENVIRONMENTAL PREFERENCES (Continued)

Principal Objective	Item	Unit	Quality of Water, Air, and Land Desired Futures 2/ 1990	 2020
EQ	1.,2. Provide erosion & sediment control	Ac. Mi.	1,319,000 2,552	1,319,000 2,552
	3. Provide tertiary sewage treatment facilities	Ea.	All presently secondary--41 move to secondary	All needed
	Provide industrial waste treatment facilities	Ea.	8	---
	4. Manage irrigation water	Ac.		---
	5. Control air pollution	Ea.	6	6
	6. Improve reservoir mgmt.	Ea.	4	4
	7. Improve riparian site protection & mgmt.	Ac.	41,000	41,000
	8. Provide additional access to public lands	No.	39	39

2/ Based on public desires, regional plans, state goals, etc.

CHAPTER IV--SUMMARY TABLE--ECONOMICAL PROJECTIONS AND ENVIRONMENTAL PREFERENCES (Continued)

Principal Objective	Item	Unit	Quality of Water, Air, and Land Desired Futures 2/ 1990	 2020
EO (Continued)	9. Control & manage land uses	Ac.	All	All
	10. Preserve all presently free-flowing streams	Ea.	All	All
	11. Control road & utility line placement and construction	Ea.	All	All
	BIOLOGICAL RESOURCES			
	12. Maintain minimum streamflows on Class I, II, III, & IV	Mi.	2,516	2,516
	13. Improve reservoir mgmt. (Hungry Horse)	Ea.	1	1
	14. Provide & protect upland habitat	Ac.	Upland 16,400 Big game 1,351,000	16,400 1,351,000
	Provide & protect wetland habitat	Ac.	No wetland drainage	
	15. Provide fish passage	Ea.	All	All
	16. Preserve & enhance archeological and historical sites	Ea.	443	443



LEGEND

🟨 Normal Winter

🟧 Severe Winter

Note: Mapped areas are general. Specific site information should be obtained from local offices of the Montana Department of Fish and Game.

MAP IV-1

ELK WINTER RANGE

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

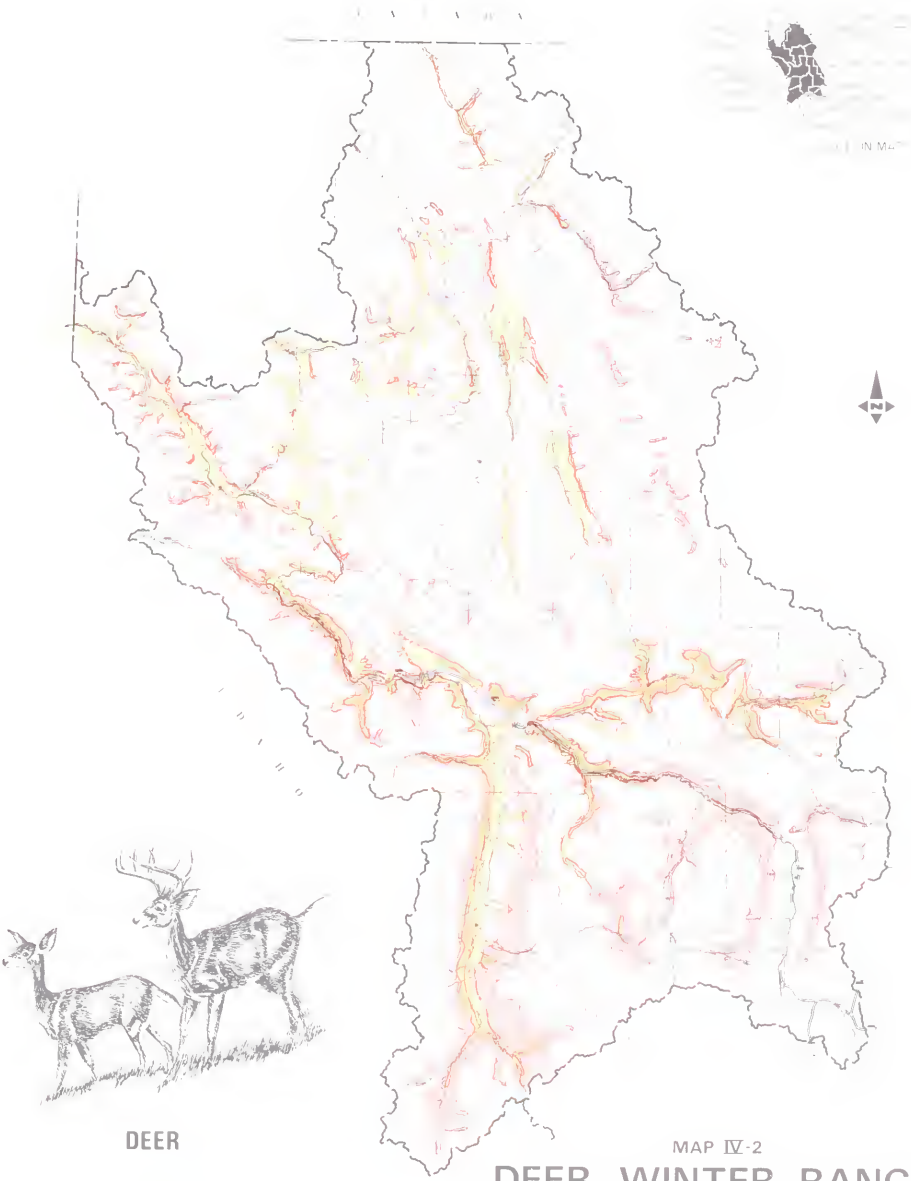
MAY 1976

10 0 10 20 30 40 50 MILES

SCALE 1:2,000,000

PRELIMINARY COPY
SUBJECT TO CHANGE

U.S. DEPARTMENT OF AGRICULTURE



DEER

MAP IV-2

DEER WINTER RANGE

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

MAY 1976

10 0 10 20 30 40 50 MILES

SCALE 1:2,000,000

LEGEND

Mule Deer 🟥🟨 White-tailed Deer

Note: Mapped areas are general. Specific site information should be obtained from local offices of the Montana Department of Fish and Game.

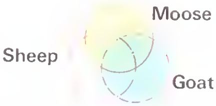
PRELIMINARY COPY
SUBJECT TO CHANGE

GOAT

MOOSE

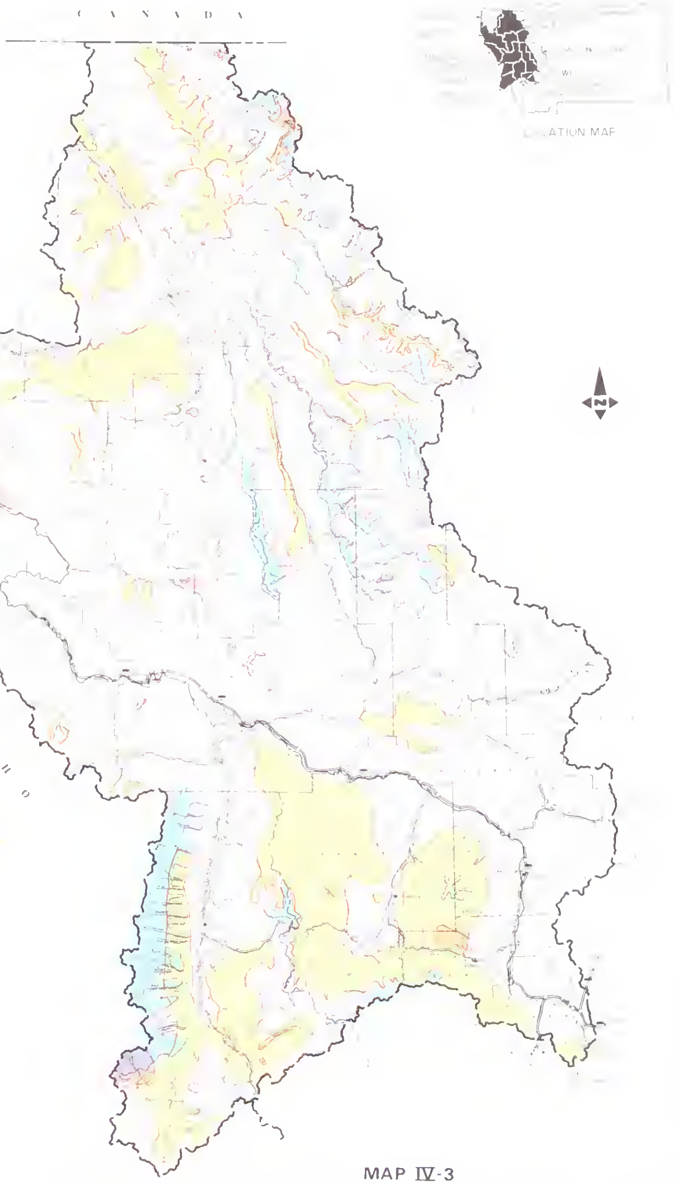
SHEEP

LEGEND



Note: TOTAL RANGE This includes major known normal annual use area, but does not include all peripheral range. Specific site information is available from the Montana Department of Fish and Game.

U.S. DEPARTMENT OF AGRICULTURE



MAP IV-3

MOOSE, SHEEP, AND GOAT RANGE

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

MAY 1976

10 0 10 20 30 40 50 MILES

SCALE 1 2 000 000

PRELIMINARY COPY
SUBJECT TO CHANGE

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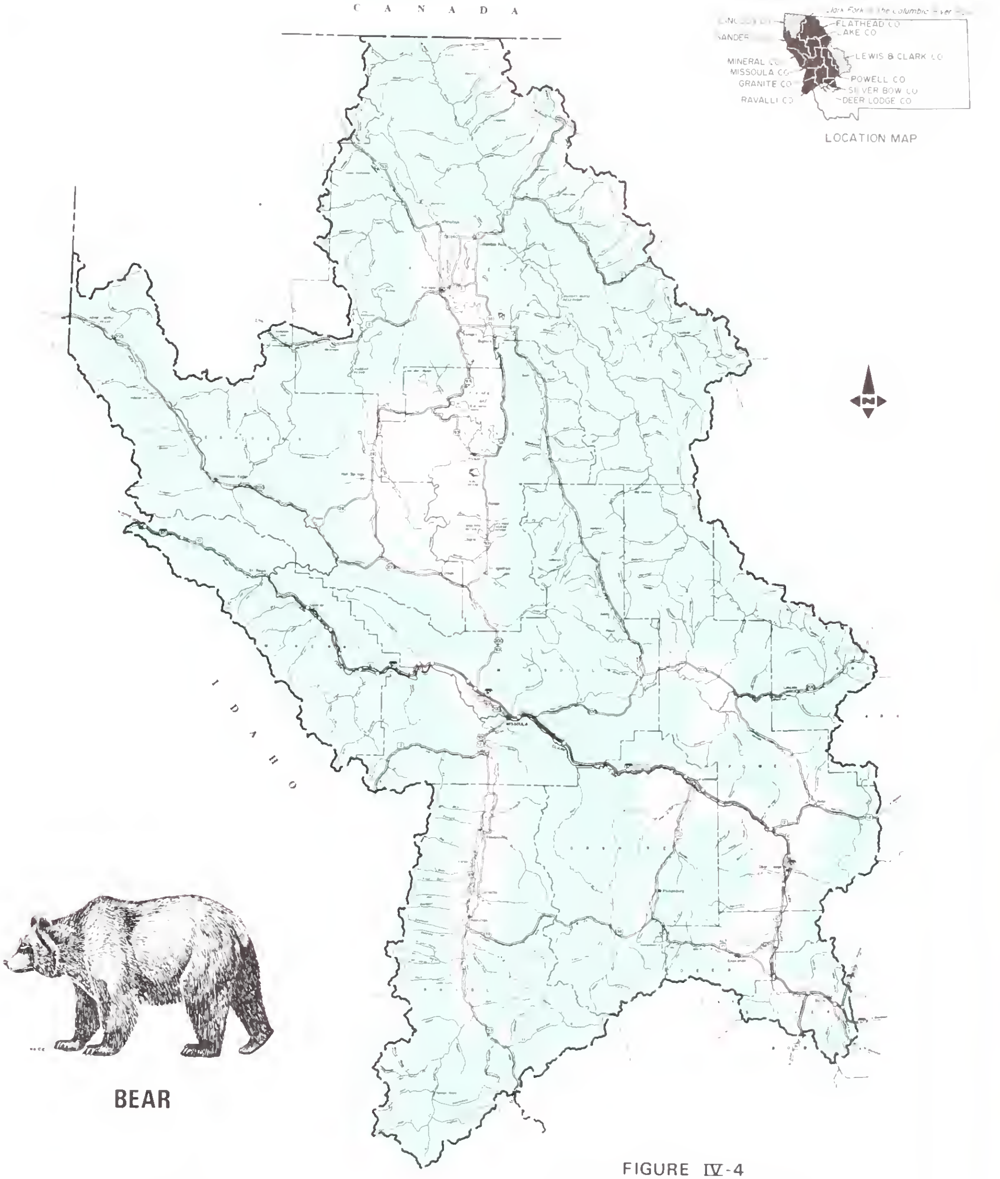

BEAR

FIGURE IV-4

BEAR RANGE

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

MAY 1976

10 0 10 20 30 40 50 MILES

SCALE 1:2 000 000

LEGEND

🟦 Bear

Note: Includes all use areas for black and grizzly bear. Specific site information is available from the Montana Department of Fish and Game.

U.S. DEPARTMENT OF AGRICULTURE

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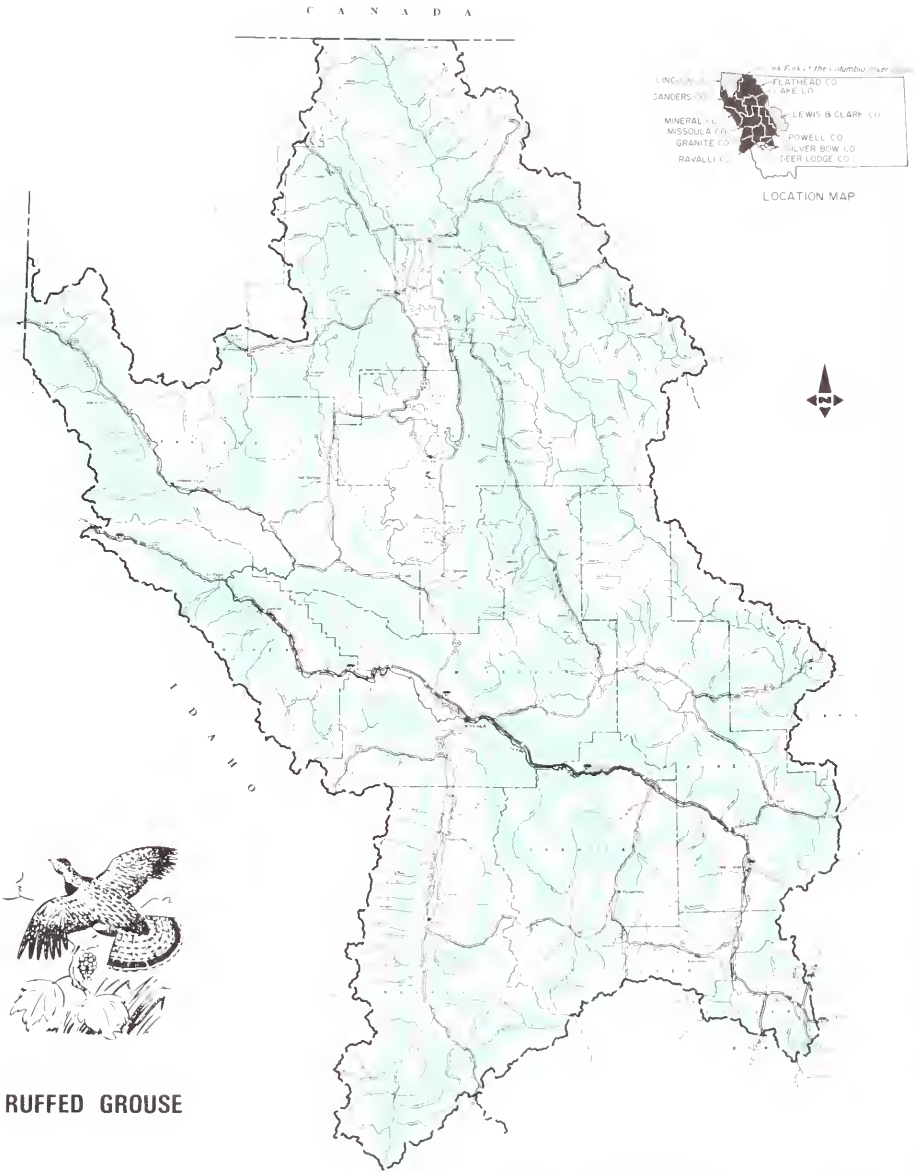

RUFFED GROUSE

FIGURE IV-5

UPLAND GAME HABITAT

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

LEGEND

🟦 Ruffed Grouse

Note: Based on vegetation patterns.

MAY 1976

10 0 10 20 30 40 50 MILES

SCALE 1:2 000 000

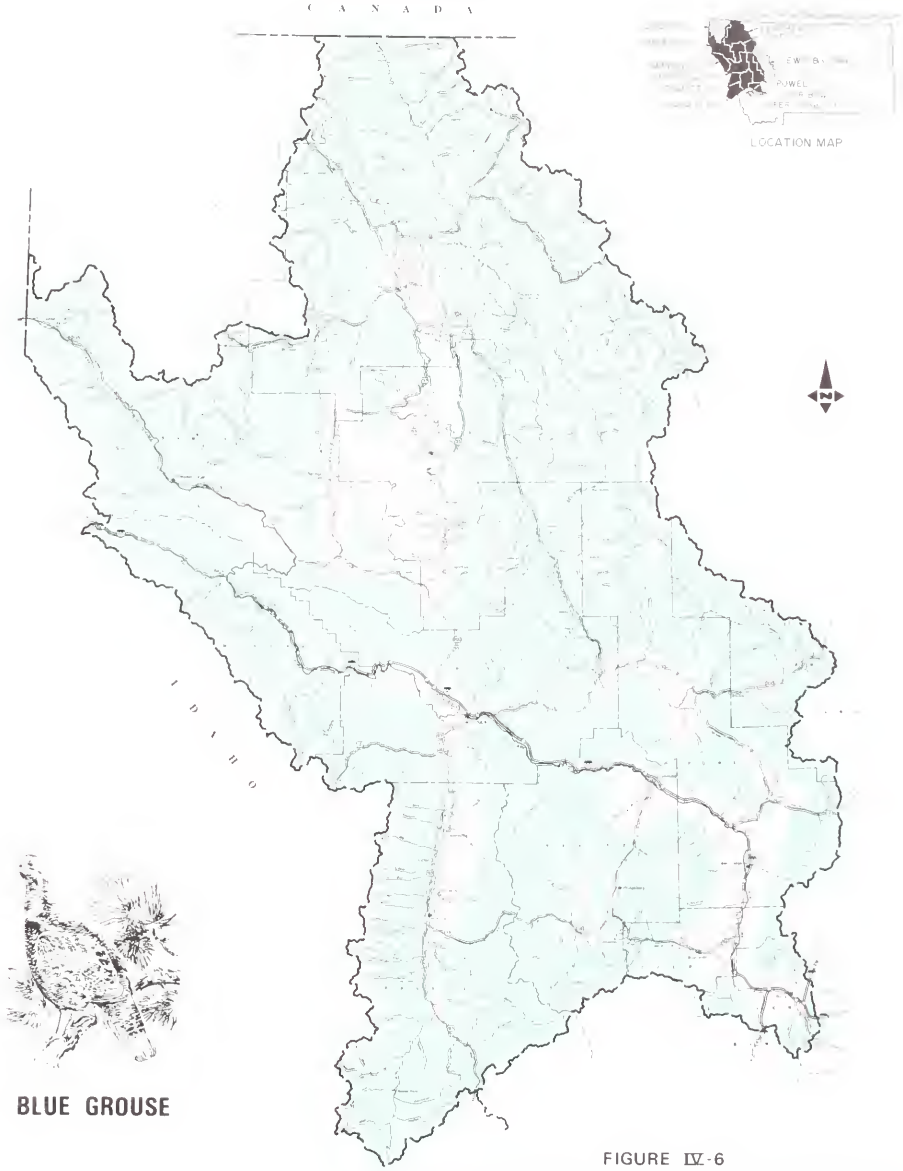

FIGURE IV-6

UPLAND GAME HABITAT

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

MAY 1976

10 0 10 20 30 40 50 MILES

SCALE 1:2,000,000

LEGEND

🟦 Blue Grouse and/or Spruce Grouse

Note: Based on vegetation patterns.

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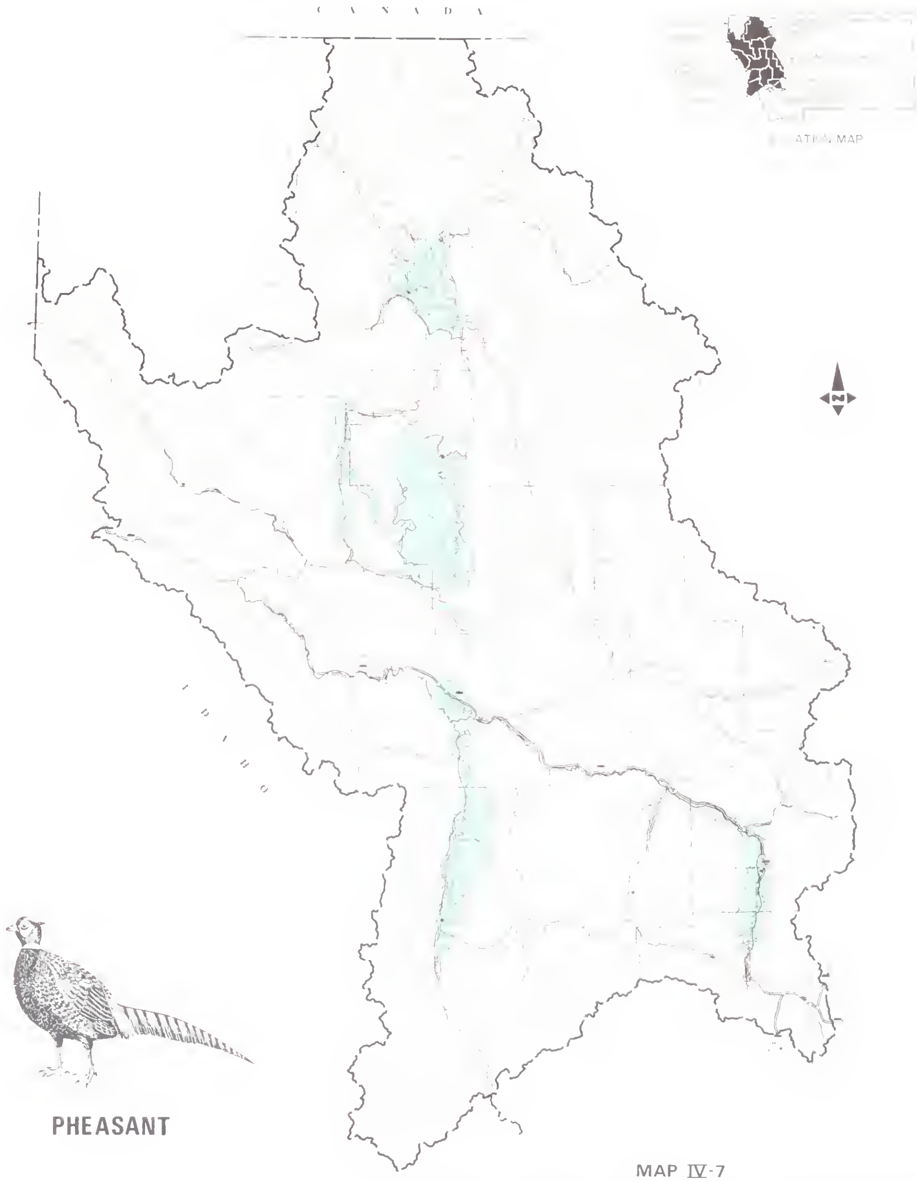

MAP IV-7

UPLAND GAME HABITAT

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

MAY 1976

10 0 10 20 30 40 50 MILES

SCALE 1:2 [illegible]

LEGEND

🟩 Ring-necked Pheasant

Note: Based on vegetation patterns.

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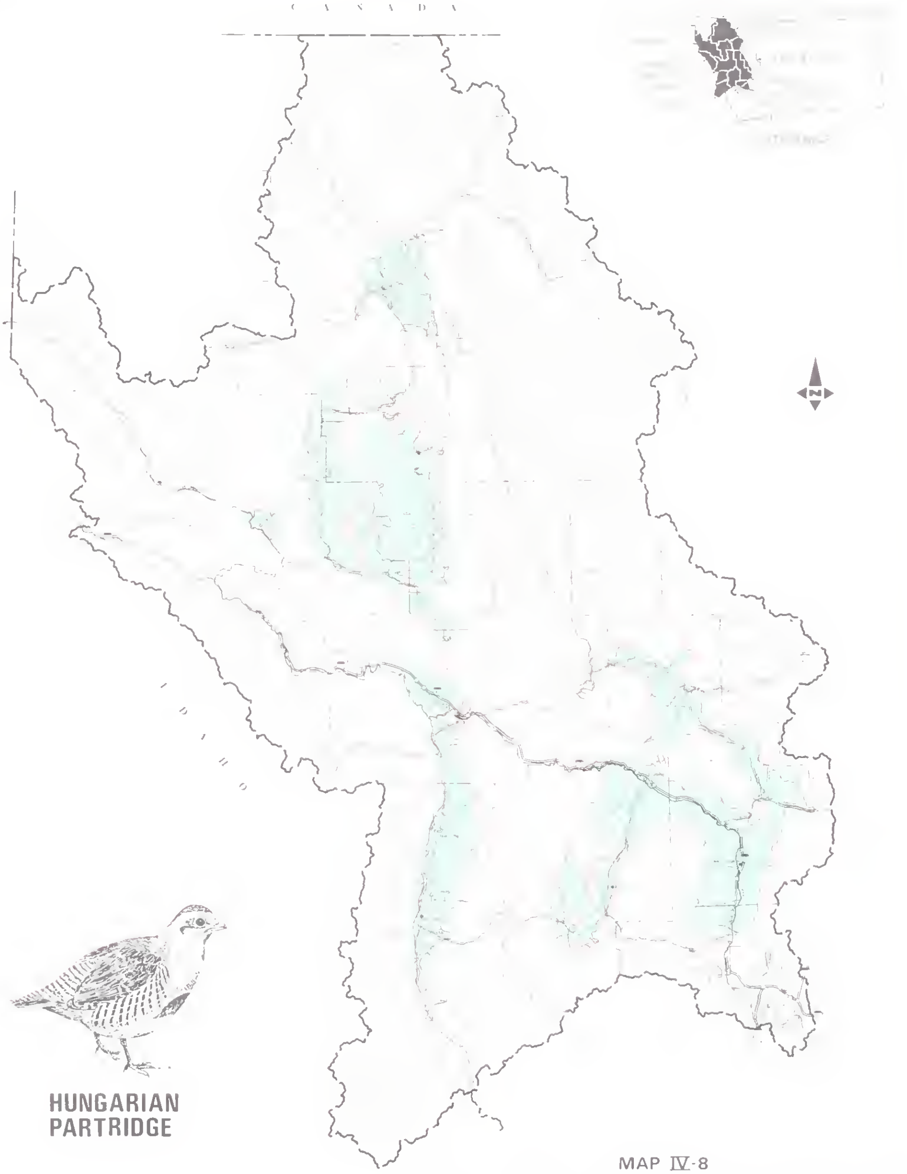

HUNGARIAN PARTRIDGE

MAP IV-8

UPLAND GAME HABITAT

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

LEGEND

🟦 Hungarian Partridge(Gray Partridge)

Note: Based on vegetation patterns.

MAY 1976

10 0 10 20 30 40 50 MILES

SCALE 1:2,000,000

PRELIMINARY COPY
SUBJECT TO CHANGE

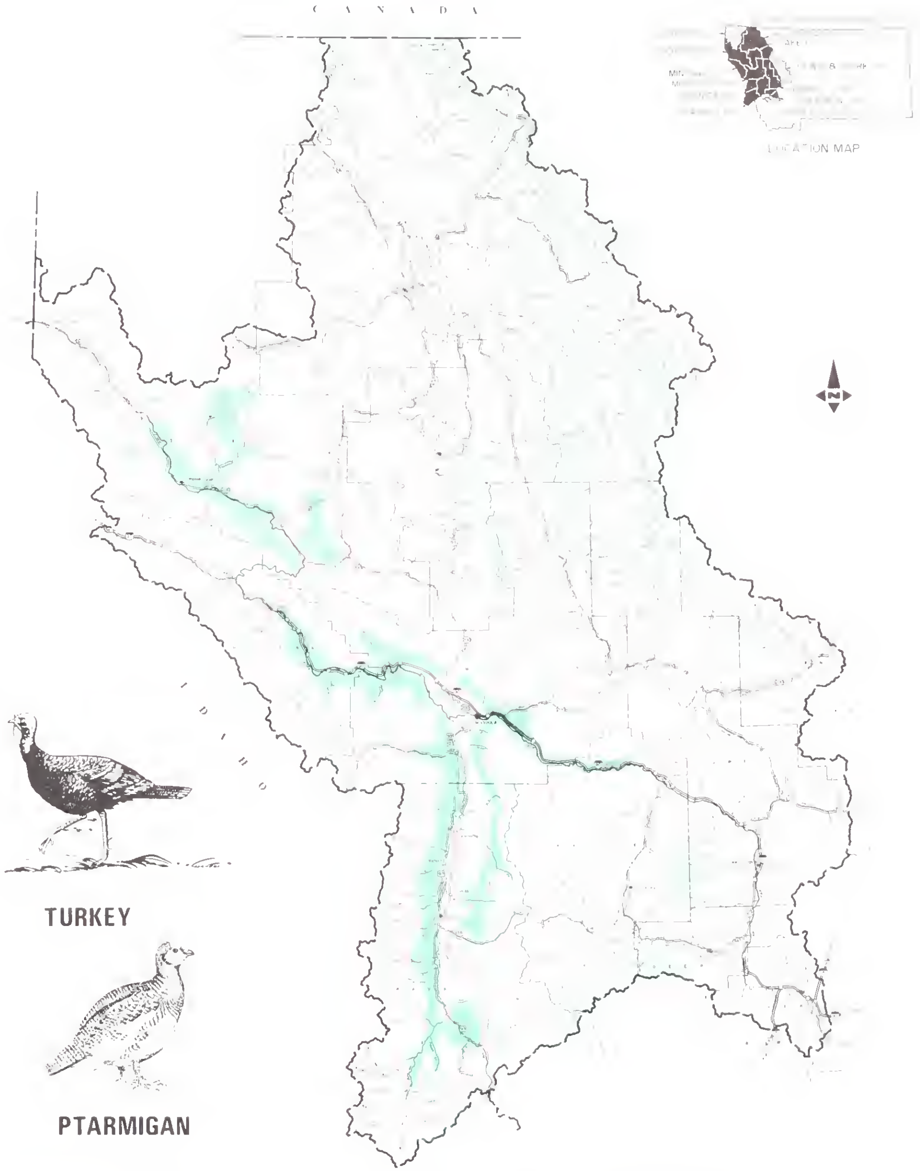

FIGURE IV-9

UPLAND GAME HABITAT

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

MAY 1976

10 0 10 20 30 40 50 MILES

SCALE 1:2 000 000

LEGEND

🟩 White-tailed Ptarmigan

🟩 Merriam's Turkey

Note: Based on vegetation patterns.

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M7-PL-23425-18

V. RESOURCE BASE AND EXISTING PROGRAMS

This chapter presents an inventory of current conditions and natural resources and programs under way which may modify the use of those resources. Current inventories present data on quantity and quality of resources, their potentials and their limitations for solving the problems and satisfying the desires of the specific components that were identified in the study and presented in chapter III.

PRESENT RESOURCE BASE

Location and Size

The Clark Fork of the Columbia River Basin in Montana includes all of the area west of the continental divide except for the Kootenai River drainage. The basin contains about 8.3 percent of the total area of the Columbia River drainage and provides about 8.8 percent of its average annual flow.

TABLE V-1--COUNTY AREAS
CLARK FORK OF THE COLUMBIA RIVER BASIN

County	Area in Basin	Percent of County in Basin
	- - acres - -	
Deer Lodge	267,780	56
Flathead	3,285,050	97
Granite	1,111,680	100
Lake	1,059,200	100
Lewis & Clark	453,620	20
Lincoln	116,130	5
Mineral	782,720	100
Missoula	1,679,360	100
Powell	1,497,600	100
Ravalli	1,528,320	100
Sanders	1,804,160	100
Silver Bow	242,870	53
TOTAL	13,828,490	

Climate

The basin climate varies from humid alpine with over 100 inches of annual precipitation on some peaks in the Bitterroot Mountains to semiarid with less than ten inches of annual precipitation a few miles east of Anaconda. High mountain ranges tend to intercept precipitation, leaving "rain shadow" dry areas downwind of them. Thus, most of the basin is made up of relatively wet mountain tops and dry valleys. The Flathead subbasin has more of a Pacific coastal climate, while the Upper Clark Fork basin has more continental weather. Temperatures around Flathead Lake are moderated by the large body of water. Average length of the frost-free season is 120 days at Flathead Lake compared with 70 days at Butte, 90 days at Deer Lodge, 54 days at Philipsburg, 36 days at Ovando, 34 days at Lincoln, 11 days at Sula, and 100 days at Missoula.1/ Map V-1 shows frost-free seasons for the entire basin. The short growing seasons and cool temperatures during the growing seasons, combined with soil and water limitations, effectively restrict the types of crops and yields that can be produced in the area. Seasonal temperature variations and averages for selected locations are shown in table V-2. In general, the temperatures are moderate for comfortable year-round habitation.

Precipitation and runoff yields are shown in maps V-2 and V-3, respectively. Effective precipitation data during the growing season

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1/ Caprio, J. M., Average length of freeze-free season. Montana Agricultural Experiment Station, March 1965

TABLE V-2--MONTHLY TEMPERATURE AVERAGES AND EXTREMES FOR SELECTED LOCATIONS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Month	BUTTE			HAMILTON			KALISPELL			MISSOULA			THOMPSON FALLS		
	Average Monthly Temp. 1/	Highest Temp. of Record 1/	Lowest Temp. of Record 1/	Average Monthly Temp. 2/	Highest Temp. of Record 2/	Lowest Temp. of Record 2/	Average Monthly Temp. 3/	Highest Temp. of Record 3/	Lowest Temp. of Record 3/	Average Monthly Temp. 3/	Highest Temp. of Record 3/	Lowest Temp. of Record 3/	Average Monthly Temp. 3/	Highest Temp. of Record 3/	Lowest Temp. of Record 3/
	- Degrees Fahrenheit -														
January	14.2	54	-48	24.1	61	-36	19.1	51	-26	22.7	44	-16	26.5	56	-36
February	18.8	60	-52	29.9	69	-36	25.0	56	-23	22.4	43	-12	33.0	64	-30
March	27.2	64	-36	36.6	74	-14	30.5	71	-29	33.0	52	5	38.0	78	-10
April	36.2	79	-13	46.4	90	1	42.0	81	12	39.3	64	16	46.9	90	17
May	46.9	88	12	54.2	102	21	50.9	89	20	49.2	84	27	55.0	97	20
June	54.5	93	23	60.1	99	29	57.0	93	28	55.4	81	33	61.2	100	30
July	62.4	100	29	67.9	101	37	64.3	104	31	71.8	100	46	68.5	109	35
August	60.0	99	27	65.9	102	34	62.5	105	31	62.1	93	35	67.2	107	32
September	50.0	91	12	57.6	95	25	53.3	99	16	56.1	86	30	59.2	106	24
October	41.0	83	-19	47.2	86	-1	42.5	81	5	43.6	79	25	48.1	89	18
November	28.2	68	-34	34.2	71	-24	30.7	65	-28	30.4	65	-5	36.3	65	-13
December	18.5	62	-37	28.7	66	-31	23.7	55	-35	25.7	59	-1	30.1	58	-25

1/ Data for Butte are through 1950 only.
2/ 1935 to 1964.
3/ 1941 to 1970
Source: Local Climatological Data - U. S. Weather Service

for selected locations and crops are shown in table V-3. Precipitation and runoff determine the total water resource available for development. Effective rainfall is that which supplies some of the water needs of crops during the growing season.

Geology

The basin is all within the Northern Rocky Mountain Physiographic Province. (More to be added with generalized geology map, map V-4.)

Mineral Resources

Data on finite quantities of economically developable mineral deposits are not available. However, data on locations of known mineral deposits and active mining operations are shown on map V-5 and its supporting legend. Metallic deposits are largely associated with the Boulder and Idaho Batholiths, and fossil fuel deposits are associated with the north and middle forks of the Flathead River in areas adjacent to Glacier National Park. The most intensive mining has been concerned with copper developments in the Butte area. Zinc, silver, gold, lead, and tin are associated with the copper deposits. Very recently, underground mining has been curtailed by decreased margins of copper prices over mining costs. Lower quality ores can be processed more economically with open pit mining. Many of the higher quality ore deposits that were mined underground have been depleted. Total employment in mining and smelting is on a steady decline.

Phosphate rock is mined near Garrison and Philipsburg and is processed into fertilizer and other chemicals at Rocker. The phosphate mine at Hall (south of Drummond) is being expanded and there is a phosphate mine east of Avon near Elliston.

TABLE V-3--NORMAL ANNUAL GROWING SEASON EFFECTIVE PRECIPITATION FOR SELECTED LOCATIONS AND CROPS

CLARK FORK OF THE COLUMBIA RIVER BASIN

Locations	Alfalfa	Grain	Grass	Orchards	Potatoes
	- - - - - - - - - - - - - - Inches	- - - - - - - - - - - - - -			
Bigfork	7.86	5.99	7.97	7.86	4.64
Creston	6.23	5.53	6.82	6.22	4.48
Darby	4.25	3.65	5.19	4.25	---
Deer Lodge	4.38	4.37	5.18	---	3.04
Drummond	4.01	3.95	4.87	---	---
Elliston	4.62	4.82	5.79	---	---
Hamilton	4.66	3.67	5.06	4.66	3.08
Kalispell	5.99	4.87	6.02	5.99	4.20
Lone Pine	3.86	3.02	4.15	---	---
Missoula	4.94	4.23	5.37	4.94	3.17
Ovando	3.26	3.79	4.99	---	---
Philipsburg	4.53	4.18	5.97	---	---
Polson	5.98	4.54	6.06	5.98	3.56
St. Ignatius	6.13	5.00	6.32	6.10	3.44
Stevensville	4.20	3.69	5.04	4.20	2.70
Superior	4.77	4.17	5.71	---	---
Thompson Falls	5.83	4.42	6.46	---	---
AVE	5.03	4.35	5.70	5.58	3.59

Water Use in the Mineral Industry

Water use by the mineral industries in the basin is dominated by the Anaconda Company operations at Butte, Anaconda, and Columbia Falls. The Butte reduction works uses three million gallons per day (mgd) of ground water while the Anaconda refinery uses 58 mgd of surface water. The Anaconda aluminum plant at Columbia Falls uses approximately one mgd of ground water. The remaining mineral processing industries use very small amounts of water.

Topography and Soils

The topography of the basin consists of a contrast of steep mountain slopes and flat river valleys with some well-defined terraces, but relatively few foothills or prairie expanses. Climate varies with elevation, landform, and orientation of slopes. With variation in climate and geology, there is variation in vegetative cover and the development of soils. Most of the soils in the basin were developed on mountain slopes under conifer forests. Lesser acreages of soils developed under tall and short grassland conditions in the valleys. Along the river bottoms, shallow cobbly and gravelly soils have developed. On outwash terraces and fans, deeper and more productive soils were formed. Above the alluvial terraces, soils were often developed directly from talus. In some areas, old lakebed sediments provided parent materials. Most of the basin had hard rock materials rather than shales as parent materials. As a result, there are larger acreages of coarser textured soils than of clays. Intensive soil surveys are not completed for the entire basin, but generalized soils data are presented on map V-6.

Vegetative Cover

Vegetative cover as described here relates to existing cover rather than potential vegetation. Map V-7 illustrates a generalized pattern of existing vegetation based on nine broad vegetation groups. Table V-4 shows: the representative vegetative species found in each of the nine groups; physical factors affecting the vegetative patterns; and uses made of vegetative groups.

Land Ownership and Use

In recognition of land ownership as one of the controlling parameters of resource development, a further description of area by counties is shown in table V-5 and map V-8.

The land use patterns of the study area remain primarily agricultural and forested. Federal noncropland totals 7.7 million acres with the remainder of 5.8 million acres in state and private ownership. Urban and builtup areas total only 139,000 acres, but this does not include all subdivision of rural lands for residential or summer home construction. The Environmental Information Center estimates that 171,827 acres have been subdivided in the study area. About 5.5 million acres are in agricultural use. Only 739,000 acres, or about 5.5 percent of the basin are in cropland. The remainder is pasture, range, private forest land, and other miscellaneous.

Present land use in the basin is one indication of present agricultural and timber production and potentials for future resource development and related changes in production. Current land use is shown on map V-9 and table V-6. These land uses include forested lands, rangelands,

TABLE V-4--VEGETATIVE COVER GROUPS--ASSOCIATED SPECIES--PHYSICAL FACTORS--RESOURCE USES
CLARK FORK OF THE COLUMBIA RIVER BASIN

Broad Vegetative Group	Rockland-Alpine	Lodgepole-Subalpine	Spruce, Fir-Lodgepole	Douglas-fir-Lodgepole	Larch-Lodgepole	Western White Pine	Ponderosa Pine	Wheatgrass-Fescue	Grassland-Shrub
	- - - - - Principal Associated Species - - - - -								
Vegetative Type:									
Trees	NA	Alpine fir Engelman spruce Whitebark pine Mtn. hemlock Lodgepole pine	Engelman spruce Subalpine fir Douglas-fir Western larch Lodgepole pine	Western larch Limber pine Engelman spruce Ponderosa pine	Douglas-fir Western white-pine Grand fir Lodgepole pine	Western larch Western red cedar Grand fir	Douglas-fir Lodgepole pine Rocky Mountain juniper	NA	NA
Shrubs	Summit willow Snow willow Red mountain-heath Western ledum	Red mountain-heath Grouse whortle-berry	Ceanothus Grouse whortle-berry Ninebark	Oregongrape Rose Spiraea Whortleberry Huckleberry	Kinnikinnick Serviceberry Spiraea Snowberry	Ceanothus Kinnikinnick Russet buffalo-berry	Snowberry Ninebark Oregongrape Rose	Willows Shrubby cinque-foil Skunkbush sumac Rabbitbrush	Mountain mahogany Bitterbrush Big sagebrush Rabbitbrush Sagewort
Grasses and Grasslike	Sedge Alpine timothy Alpine blue-grass Sheep fescue	Richardsons needlegrass Idaho fescue Elk sedge Mountain brome	Bluegrass Pinegrass Elk Sedge	Pine reedgrass Sedge Bluegrass	Pine reedgrass Sedge Little ricegrass	Elk sedge Pinegrass	Rough fescue Bluebunch wheatgrass Idaho fescue Western wheatgrass	Bluebunch wheatgrass Rough fescue Idaho fescue Columbia needle-grass	Idaho fescue Threadleaf sedge Wheatgrass Needleandthread
Forbs	Clubmoss Lupine Bluebell Alpine forgetmenot	Arnica Aster Lupine Beargrass	Aster Beargrass Indianpaintbrush Fleabane	Arnica False solomons-seal Showy aster	Arnica Beargrass Glacier lily	Lupine Arnica	Arrowleaf balsamroot Lupine Buttercup	Lupine Yarrow Arrowleaf balsam-root	Phlox Rose pussytoes Lupine
Physical Factors:									
Topography	Above timberline	Rough mountains	Mountains--valley bottoms	Mountains	Mountains--valley bottoms	Mountains	Foothills and benches	Rolling hills-plains	Undulating uplands
Elevation range (ft.) (above mean sea level)	6000-10,665	3500-9500	3000-9000	3000-7900	3000-7000	3000-6100	3300-6000	3000-6000	3000-5500
Precipitation zone	50''-120'	20''-100'	40''-100''	18''-30''	20''-50'	40''-70''	10''-30''	10''-19''	10''-14''
Soils	Rocky Shallow	Sandy loams Rocky	Young loam Alluvial Gravels	Loam Sand Gravel	Sandy loams Clay	Silty loam Clay loam	All loams Loamy sands Gravel	All loams & clays Shallows and stoney	Rocky to gravelly loams
Resource Uses:	Recreation Wildlife Watershed	Recreation Wildlife Timber Watershed	Watershed Wildlife Recreation Timber	Timber Watershed Wildlife Recreation Grazed woodlands	Timber Watershed Wildlife Recreation Grazed woodlands	Timber Watershed Wildlife Recreation	Wildlife Timber Recreation Grazed woodland Watershed	Agriculture Range Wildlife Recreation	Range Wildlife

Source: River Basin Planning Staff

TABLE V-5--LAND OWNERSHIP BY COUNTIES

TABLE V-6--CURRENT LAND USE

dry cropland, irrigated land, urban and builtup land, national park, and other reserved lands. Map V-10 and table V-7 show rangelands by condition. Estimated trends in irrigated cropland are shown in figure ______.

One of the ongoing changes in land use that was identified as a concern in public meetings was the subdivision of private agricultural and forested lands. Once these lands are subdivided, their agricultural and timber production declines or stops. Subdivided lands were mapped and tabulated by the Environmental Information Center, a private nonprofit agency. Those data are shown on map V-11 and table V-8.

Forest lands were identified according to current status and inherent capacity to grow trees. Table V-9 shows that 58 percent of the Clark Fork study area is now in the status of commercial forest land and constitutes the resource base for industrial wood growth. All this land can grow wood at a rate of 20 cubic feet or more per acre per year and is available for harvest. Another 19 percent of the study area is forested but is not part of the timber-growing base because it is either not productive enough or it is not available due to other priorities of use. The remaining 23 percent of the study area is not forested. These data are shown on table V-9 and map V-12.

TABLE V-7--RANGELAND CONDITIONS

TABLE V-8--SUBDIVIDED LANDS

TABLE V-9--LAND AREA BY FOREST LAND CLASS--TEN-COUNTY STUDY AREA CLARK FORK OF THE COLUMBIA RIVER BASIN

Land Class	Thousand Acres
Commercial forest land [1]	7,823
Unregulated	36
Deferred [2]	100
Noncommercial forest land:	
Unproductive-nonreserved	833
Productive-reserved [3]	863
Unproductive-reserved	749
Total forest land	10,404
Nonforest land	3,153
Total land area	13,557

Source: Forest Survey 1970

[1] Includes all areas presently or prospectively suitable and available for timber growing, including productive areas currently inoperable or inaccessible but not in wilderness or potential wilderness areas.

[2] Areas deferred pending study to determine appropriate land use. Since 1970 about 2,297,000 acres of commercial and noncommercial national forest land have been designated as roadless areas. About 1,587,000 acres of this are commercial forest.

[3] Forest land sufficiently productive to qualify as commercial forest land, but withdrawn from timber utilization because of (a) legal withdrawals, (b) administrative withdrawals such as forested administrative sites, natural areas, lands not available for timber production because of conflicts for nontimber uses.

Of the 1970 commercial timber base, only 48 percent of it is capable of growing in excess of 85 cubic feet of industrial wood per acre per year. It is on this portion of the timber growing base that financial returns to management are high enough to attract investment capital. On the other 52 percent of the timber growing base, the rate of return is less attractive and the land cannot economically receive intensive management until such time that the project value for wood increases or there are technological innovations in management, manufacturing, or marketing of timber products.

Thirty percent of the commercial timber growing base is in private ownership consisting of forest industries, farmers, and miscellaneous private entities. Only 11 percent of these private commercial forests have the capacity to grow more than 85 cubic feet of wood per year as shown in table V-10.

TABLE V-10--COMMERCIAL FOREST LAND BY OWNERSHIP GROUP AND PRODUCTIVITY CLASS 1/--TEN-COUNTY STUDY AREA
CLARK FORK OF THE COLUMBIA RIVER BASIN

Productivity Class 2/	All Ownerships	National Forest	Other Public	Forest Industry	Farmer and Miscellaneous Private
	- - - - - - - - - - - - Thousand acres - - - - - - - - - - - - -				
120'+	1,260	1,188	19	21	32
85'-119'	2,468	2,195	75	86	112
50'-84'	1,955	597	383	322	653
20'-49'	2,140	601	457	286	796
All classes	7,823	4,581	934	715	1,593

Source: USDA Forest Resource Bulletin INT-10, 1970, by Alan W. Green and Theodore S. Setzer, Table 16, adjusted to represent study area.

1/ The classification of forest land in terms of inherent capacity to grow crops of industrial wood.

2/ Growth in cubic feet per acre per year on all trees 4.0 inches or larger in diameter in fully stocked stands at culmination of mean annual growth.

Thirty percent of the commercial forest land is controlled by more than 8,000 private owners. However, as few as 250 owners control 72 percent of the private timber base. About half of private owners control less than 40 acres each and the aggregate amount of land involved is only three percent of the private timber base. These relationships are shown in table V-11.

TABLE V-11--OWNERSHIP OF PRIVATE COMMERCIAL FOREST LAND BY SIZE OF
OWNERSHIP--TEN-COUNTY STUDY AREA
CLARK FORK OF THE COLUMBIA RIVER BASIN

Size of Ownership (Acres)	Owners		Acreage Owned	
	Number	Percent	Thousands	Percent
0 to 39	4,489	51.3	70	3.0
40 to 159	2,845	32.5	234	10.1
160 to 639	1,178	13.4	347	15.1
640+	247	2.8	1,657	71.8
All sizes	8,759	100.0	2,308	100.0

Based on Montana Forest Fire Protection Assessment Rolls--1970

Potentials for Land Use

As noted earlier in this chapter, potentials for major changes in land use are limited by topography, climate, land ownership, and reservation of land for national parks, national forests, wilderness areas, and wildlife refuges. The importance of limitations approximates the order shown. Most of the practical shifts from forest to range; from range to cropland; from dry cropland to irrigated cropland; and from cropland to urban use have already occurred. Additional shifts in the future will be more and more expensive. The greatest potential change in production lies in conversion of more acreages of conventional irrigation to sprinkler irrigation. Some other acreages will be subdivided and converted to residential use; but, unless large amounts of additional manufacturing are brought into the basin, this conversion will be rather limited.

Lands with physical potential for irrigation development were identified by the Montana Department of Natural Resources and Conservation. No attempt was made during the inventory stage to differentiate irrigable lands on the basis of economic feasibility, water rights, or land ownership and administration. By comparison of the irrigable areas map and the land ownership map, it can be seen that some of the physically irrigable land lies in Glacier National Park and in various national forest reserves. Irrigable lands in these reserved areas are not apt to be developed in this century. Data on physically irrigable lands are shown in table V-12 and map V-13.

Water Resources

Surface Water:

Average annual discharge from the basin for the 1928-1974 period was 16,220,000 acre-feet. Inflow from Canada contributed 718,700 acre-feet for a net basin runoff of 15,501,300 acre-feet. Total basin precipitation averages about _________ acre-feet, including evaporation from water surfaces, _____________ acre-feet; evapotranspiration from irrigation crops, __________ acre-feet; evapotranspiration from other vegetative areas, __________ acre-feet; and phreatophytic and other uses of ____________ acre-feet. Total irrigation diversions

TABLE V-12--PHYSICALLY IRRIGABLE LANDS

from streams average about 2,200,000 acre-feet. Average annual streamflows are shown on map V-14.

In perspective, it is obvious that the basin has a tremendous annual gross surplus of water. However, there are seasonal shortages of water for most uses. These temporal shortages may be overcome with storage of early season runoff for late season use where there are physically and economically feasible storage sites that are environmentally acceptable and have sufficient total annual streamflows. Table V-13 lists the existing large reservoirs in the basin.

Ground Water:

Although ground water is often considered as a separate resource in terms of its location, problems, and quality, it is actually just a part of the overall water yield. All water in the basin arrives as precipitation and leaves the basin by evaporation, streamflow, or ground-water flow. An examination of the topography and geology of the basin indicates that the exit of water from the basin through subsurface flow is relatively minor. However, ground-water flows and storages in aquifers within the basin are a very important part of the basin's water supply.

The consideration of ground water as a storage reservoir presents a different set of factors than are found in surface storage. Water quality is often affected by the duration of contact with soluble minerals or by deep percolation of surface waters contaminated by agricultural chemicals or sewage effluents. In general, deeper wells are less apt to be contaminated from surface sources than are shallow wells, but

TABLE V-13--RESERVOIRS HAVING TOTAL CAPACITY OF 5,000 ACRE-FEET OR MORE

CLARK FORK OF THE COLUMBIA RIVER BASIN

Name	Stream	Total Storage (acre-feet)	Active Storage (acre-feet)	Surface Area (acres)
Ashley Lake	Ashley Lake	20,000	20,000 I	3,000
Cabinet Gorge	Clark Fork R.	112,000	42,000 P	3,230
Como Lake	Rock Cr.	36,690	34,900 I	940
Flathead Lake	Flathead R.	1,791,000	1,219,000 P	126,000
E.F. Rock Creek	E.F. Rock Cr.	16,040	16,000 I	440
Georgetown Lake	Flint Cr.	31,040	31,000 P	3,000
Hubbart	L. Bitterroot R.	12,100	12,100 I	460
Hungry Horse	S.F. Flathead R.	3,468,000	2,982,000 P	23,750
Kicking Horse	Crow Cr. (offstream)	8,420	8,350 I	785
L. Bitterroot Lake	L. Bitterroot R.	26,400	26,000 I	2,990
Lower Crow	Crow Cr.	10,350	10,350 I	340
Lower Jocko Lake	M.F. Jocko R.	7,580	6,380 I	115
Lower Willow Creek	Willow Cr.	5,100	4,800 I	170
McDonald	Post Cr.	10,600	8,200 I	200
Mission	Mission Cr.	7,250	7,250 I	290
Nevada Creek	Nevada Cr.	12,640	12,640 I	375
Ninepipe	Flathead R. (offstream)	14,870	14,870 I	1,600
Noxon Rapids	Clark Fork	495,600	334,600 P	7,900
Pablo	Flathead R. (offstream)	29,600	27,100 I	2,040
Painted Rocks Lake	W.F. Bitterroot R.	32,360	31,700 I	655
Tabor (St. Mary Lake)	Dry Cr.	23,300	23,300 I	285
Thompson Falls	Clark Fork	69,400	14,970 P	1,450
		6,240,340	4,888,310	180,015

Source: Montana Department of Natural Resources and Conservation

I = Irrigation
P = Power

are more apt to contain undesirable salts. Because deeper ground water is less apt to have coliform contamination than is surface water, the Montana Department of Health and Environmental Sciences is actively encouraging towns and communities to develop potable supplies from ground water.

In some areas, ground-water aquifers carry water in sufficient quantities that irrigation wells can be developed without seriously affecting elevations of the water table. Ground-water supplies, depths to water, and expected yields are shown on map V-15.

Most of the ground-water supplies are of good enough quality for irrigation, livestock, and domestic use. At the present time, ground-water recharge exceeds withdrawals in the basin.

Water Uses

Municipal:

Public water systems in 50 communities serve 70 percent of the basin population. Nine are served by surface water only; eleven use a combination of surface and ground water; and the remainder use ground water exclusively. See table V-14 for sources of municipal water. Over 57,000 persons are served by ground water and over 86,000 persons use surface water. Total municipal water withdrawal is 54 million gallons per day, or 60,000 acre-feet per year. Water use averages 377 gallons per person per day. About 60 percent of this water returns to the streams.

TABLE V-14--SOURCES OF MUNICIPAL WATER

CLARK FORK OF THE COLUMBIA RIVER BASIN

Community	Source
Alberton	Ground-water springs
Anaconda	Ground-water wells and surface water (Hearst Lake and Warm Springs Creek)
Anaconda Job Corps	Ground-water springs
Bigfork	Ground-water wells
Red Gate	Ground-water spring
Woods Bay	Ground-water well
Butte	Surface water (Big Hole River, Basin Creek, and Moulton Creek)
Charlo	Ground-water well
Columbia Falls	Ground-water wells and surface water (Cedar Creek Reservoir)
Columbia Heights	Ground-water wells
Coram	Ground-water springs
Darby	Ground-water well
Deer Lodge	Ground-water wells and infiltration gallery; surface water (Tin Cup Joe Creek)
State Prison	Ground-water wells
Dixon Agency	Ground-water well and spring
Elmo	Ground-water wells
Essex	Surface water (Essex Creek)
Evergreen	Ground-water well
Galen	Ground-water wells
Hamilton	Ground-water wells
Heron	Ground-water well
Hot Springs	Ground-water wells and surface water (Hot Springs Creek)
Hungry Horse	Ground-water well
Kalispell	Ground-water wells and infiltration gallery on Stillwater River
Kerr Dam	Surface water (Flathead River)
Lakeside	Ground-water wells
Lolo (Lakeview)	Ground-water well
Martin City	Ground-water wells
Missoula	Ground-water wells and surface water (Rattlesnake Creek)
Noxon	Surface water (Pilgrim Creek)
Noxon Dam	Ground-water wells
Paradise	Ground-water well
Philipsburg	Surface water (Fred Burr Lakes, So. Boulder Creek, Frost Creek)

TABLE V-14--SOURCES OF MUNICIPAL WATER (Continued)

Community	Source
Plains	Ground-water springs and well
Polson	Ground-water wells and surface water (Hell Roaring Creek)
Ramsay	Ground-water wells
Ronan	Ground-water wells and surface water (Crow Creek)
Ronan Job Corps	Ground-water wells
Round Butte	Ground-water well
St. Ignatius	Ground-water well and surface water
St. Ignatius Indian Health Service	Ground-water well
Saltese	Surface water (Silver Creek)
Seeley Lake	Surface water (Seeley Lake)
Somers	Surface water (Flathead Lake)
Stevensville	Ground-water wells and infiltration gallery on Burnt Fork Creek
Summit	Ground-water well
Superior	Ground-water springs and a well
Thompson Falls	Ground-water well and surface water (Ashley Creek)
Trout Creek	Ground-water well
Warm Springs	Ground-water wells
West Glacier	Ground-water spring and well
Whitefish	Surface water (First, Second, and Third Creeks and Whitefish Lake)
Woodlin	Ground-water well

Source: Montana Department of Health and Environmental Sciences

Rural Domestic:

Thirty percent of the basin's residents use private wells as the main source of water for domestic use. As rural use is very difficult to measure, an estimate of 125 gallons per person per day was used to estimate present and future water use in rural areas. The 60,000 rural residents (those not served by municipal systems) of the basin withdraw 7.5 million gallons per day (8,400 acre-feet per year) of water primarily from ground-water sources.

Livestock Water Use:

Livestock water use in the basin approaches four million gallons per day or 4,300 acre-feet per year. While cattle and pigs are increasing in numbers, milk cows, sheep, and chickens are decreasing. Horse population tends to vary with the human population. Water use is estimated to be obtained about equally from surface and ground-water sources.

Self-supplied Industry:

Industries in the basin supplying their own water (as opposed to those using water from municipal sources) withdraw 26.5 million gallons per day (29,000 acre-feet per year) of surface water and 56 million gallons per day (53,000 acre-feet per year) of ground water for primary metals refining, paper processing, and other uses.

Irrigation:

There are about 431,700 acres of irrigated cropland in the basin for which about 2.2 million acre-feet of water are diverted during the growing season. About 60 percent or 1.2 million acre-feet of this water returns to the streams via surface and subsurface flows.

Sources of existing water development for the irrigated acres that are shown on map V-16 are shown in table V-15. That table shows acreages served, water quantities needed, water quantities diverted, acre-feet of stored water, acre-feet of deficiency, and potential sources of water to offset the deficiency. Existing water storage in reservoirs with over 5,000 acre-feet of capacity is shown in table V-13. From this table it can be seen that irrigation storage is only about five percent that of power storage.

National Forest Water Uses:

Water requirements on the national forests are expressed as flow requirements in cubic feet per second in table V-16. Most of these are nonconsumptive uses or are accounted for in the consumptive uses mentioned before.

Water Rights

In 1921 the Montana Supreme Court declared that the Doctrine of Appropriation is the valid Montana water-right law. Montana streams are the property of the state and the appropriator acquires only a use right to the water and the use must be beneficial. Under the 1973 Montana Water Use Act, beginning on July 1, 1973, all Montana waters--surface, ground, and geothermal--were included in one administrative system under the Montana Water Use Act. At the same time, the Act greatly altered the method of securing the right to water use in the state and provided a centralized water rights filing system in Helena as well as in the county courthouses. A more detailed description of Montana's water rights is included in Appendix V-1 of this report.

TABLE V-15--SOURCES OF WATER FOR EXISTING IRRIGATED LANDS

TABLE V-16--FLOW REQUIREMENT WATER USES ON NATIONAL FORESTS
CLARK FORK OF THE COLUMBIA RIVER BASIN

	Reserved Lands												Acquired Lands											
	Existing						Foreseeable						Existing						Foreseeable					
Montana NF's	100	200	300	400 500	600	800	100	200	300	400 500	600	800	100	200	300	400 500	600	800	100	200	300	400 500	600	800
									- cubic feet per second -															
Bitterroot NF (03)	.659	.476	6.800	.038	.500	.001	.006	2.140	-	.014	1.000	-	.180	.081	-	.012	.212	-	-	.227	-	.004	.138	-
Deerlodge NF (09)	.601	2.723	2.261	1.080	-	-	.540	11.231	14.991	.117	-	.004	-	-	-	.007	-	-	-	-	-	-	-	-
Flathead NF (10)	.324	.424	-	-	-	-	.348	6.250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Helena NF (12)	.001	1.164	.001	.015	-	-	.160	4.738	.206	.013	.333	-	.001	-	-	.002	-	-	-	.048	-	-	-	-
Lolo NF (16)	8.587	4.541	.179	10.468	-	-	.188	12.366	.772	-	-	-	11.136	.038	.062	.038	-	-	.600	4.886	.158	-	.690	-
Grand Totals	10.172	9.328	9.241	11.601	.500	.001	1.242	38.725	15.969	.144	1.333	.004	11.317	.119	.062	.059	.212	-	.600	5.161	.158	.004	.828	-

USE CODES

100	Domestic
200	Recreation
300	Fish Culture
400 500	Stockwater
600	Irrigation
800	Other

Potentials for Improved Water Supply and Quality:

As discussed earlier, the fundamental water problem is one of temporal shortage rather than gross volume shortage of water. This temporal shortage affects late summer consumptive use and low flow nonconsumptive uses most acutely concerned with water quality. Potentials for solving temporal shortages depend on availability of surplus spring runoff flows and feasible storage sites. In most drainages there are surplus flows, but economic and engineering evaluations of most storage sites show them to be very expensive in relation to monetary benefits that would derive from their construction.

Recreation Facilities and Use

The real resource for outdoor recreation in the study area is the natural attractiveness of its landscape. Much of this same landscape is simultaneously used for local economic needs of employment and income by producing food and fiber for national markets. A portion of the outdoor recreation activity is dispersed and is nonconsumptive. Another portion of the outdoor recreation activity focuses upon localized attractions and requires special attention in the form of management and maintenance. The facilities provided by the landowner on these localized attraction areas represent an additional resource. An inventory of such facility resources is provided in tables V-17, V-18, V-19, and map V-17 for public and privately owned land in the study area.

TABLE V-17--RECREATION FACILITIES ON FEDERAL, STATE, AND INDIAN LAND

CLARK FORK OF THE COLUMBIA RIVER BASIN

Agency or Subarea	Picnic Tables	Camping Spaces	Swimming Beaches	Fishing Sites	Boat Ramps
Federal					
Park Service	0	674	0	9	3
Forest Service	425	1,157	32	82	27
Fish & Wildlife Service	35	0	0	4	0
State of Montana					
Dept. of Fish & Game	396	509	16	59	25
Division of Forestry	0	28	0	3	0
Indian Reservation	5	20	1	1	1
Large Corporation	7	0	4	4	4
Totals	868	2,388	53	162	60
Flathead	437	1,339	29	85	35
Lower Clark Fork	276	684	13	38	20
Upper Clark Fork	155	365	11	39	5
All subareas	868	2,388	53	162	60

Source: Montana Department of Fish and Game July 1976

TABLE V-18--PRIVATE RECREATION FACILITIES 1/
CLARK FORK OF THE COLUMBIA RIVER BASIN

Facilities	Units	Flathead Subarea	Lower Clark Fork Subarea	Upper Clark Fork Subarea 2/	Clark Fork Study Area
Campground spaces		3,064	763	634	4,461
Fishing waters (ponds or lakes)		54	5	10	69
Golfing facilities		5	8	3	16
Hunting areas					
(no. of enterprises)		10	15	40	65
(acres)		2,688	8,502	13,001	24,191
Picnic tables		11	3	136	150
Racing					
Sites		2	2	3	7
No. spectators		12,000	5,000	1,650	18,650
Rodeo, outdoor theaters, etc. (no.)		7	9	11	27
Acres		66	79	53	198
Snow-ski areas		2	4	4	10
Snowmobile areas (acres)		1,726	1,380	7,626	10,732
Miles of trail		69	7	88	164
Trails, hiking (miles)		52	21	34	107
Trails, horse (miles)		87	73	2,521	2,681
No. horse rentals		318	148	674	1,140
Vacation farms or dude ranches		4	13	18	35
Water sports areas					
Boat ramps (no.)		42	4	4	50
Boat rentals (no.)		217	55	19	291
Boat dry storage		347	1	0	348
Boat slips or morrings (no.)		543	52	96	691
Swimming beach (linear ft.)		12,925	430	150	13,505
Swimming pool (sq. ft.)		9,425	23,325	32,066	64,816

Source: Soil Conservation Service 1976

1/ Only those enterprises which charge a fee and are located on private property were inventoried.
2/ Includes only those portions of Deer Lodge, Lewis and Clark, and Silver Bow Counties in the Clark Fork Basin.

TABLE V-19--URBAN RECREATION FACILITIES PROVIDED BY SCHOOLS AND CITIES
1973

CLARK FORK OF THE COLUMBIA RIVER BASIN

	Flathead Subarea	Lower Clark Fork Subarea	Upper Clark Fork Subarea	Clark Fork Study Area
Indoor ice rinks	0	0	1	1
Outdoor ice rinks	3	4	18	25
Indoor track	1	1	2	4
Outdoor track	6	9	6	21
Football fields	7	8	12	27
Baseball fields	25	31	23	79
Outdoor basketball courts	11	16	19	46
Indoor basketball courts	19	16	27	62
Indoor valleyball courts	15	13	25	53
Outdoor volleyball courts	2	9	6	17
Badminton courts	0	7	0	7
Golf courses	4	1	1	6
Outdoor tennis courts	10	19	16	45
Indoor tennis courts	13	2	0	15
Outdoor swimming area	3	4	3	10
Indoor swimming pool	1	3	4	8
Wading pools	0	8	1	9
Stage	2	2	3	7
Meeting rooms	(- - - - - - - - - numerous - - - - - - - - - -)			
Tot lots	6	16	22	44
Boating facilities	4	0	0	4
Playgrounds	16	18	26	60
Picnic areas	9	26	7	42
Rifle range	1	0	5	6
Rollerskating rink	0	0	0	0
Bowling alleys	0	0	0	0
Gymnasiums	0	2	22	24
Craft rooms	0	0	2	2
Shelters	6	0	2	8
Toboggan slides	0	0	1	1
Ski runs	1	0	2	3
Handball-Paddleball courts	0	0	4	4

Source: Montana Statewide Survey of Urban Recreation Programs and Facilities, Montana Department of Fish and Game, 1973.

The level of participation in outdoor recreation in the study area is estimated to have been near 14 million activity occasions in 1970. The variety and amount of participation is shown in table V-20.

Camping is a key activity which requires special attention with regard to the need for facilities. The analysis of camping facilities relative to the amount of camping activity provides an insight into the nature of recreation in the study area. Table V-21 is an estimate of where and by whom camping was done in 1970.

In Montana, one of the outstanding characteristics of the present day recreational use is the pronounced increase in dispersed recreation activity. Today's recreationist is no longer content, if he ever was, with the recreational opportunity provided on an isolated tract with facilities. While these existing facilities are used, especially those associated with water resources, the recreationist has expanded his horizons and now roams far and wide on the public lands in search of new opportunity. The key to this new phenomena is the mobility and self-sufficiency of the user. A mobile and self-sufficient outdoorsman is a discriminating user and facilities not to his liking will be bypassed in favor of more attractive areas in the next county or in the next forest. Little development is actually needed in many instances. Perhaps as much as 65 percent of the camping that occurred in the study area in 1970 was intentionally away from developed facilities as indicated for the Upper Clark Fork subarea in table V-22. So phenomenal is this increase and so varied and dispersed is the activity that it is impossible to measure or describe it with any accuracy.

TABLE V-20--TOTAL PARTICIPATION IN OUTDOOR RECREATION ACTIVITIES CLARK FORK OF THE COLUMBIA RIVER BASIN

Activity	Annual Participation Activity Occasions 1/
Camping	1,701,800
Picnicking	810,800
Swimming	345,400
Sightseeing and driving for pleasure	4,952,900
Fishing	639,800
Boating	248,200
Water skiing	96,700
Walking and hiking	1,489,200
Hunting	358,500
Playing outdoor games	477,400
Bicycling	420,900
Golfing	83,900
Horseback riding	162,300
Attending outdoor sporting and/or culture events	1,532,600
Snow activities	519,500
Other	1,088,900
Total	14,928,800

1970

Source: Recreation Committee--Pacific Northwest River Basin Commission

1/ Activity occasions are defined as an individual's participation in a single recreation activity during part or all of one day. An individual participating in three different activities during the day is recorded as three "activity occasions".

TABLE V-21--ESTIMATED DISTRIBUTION OF CAMPING AND ORIGIN OF CAMPERS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Subarea	Local	From Remainder of Study Area	Rest of Montana	Out of State	Total
	- - - - - - - Thousands of Activity Occasions - - - - - - -				
Flathead	47.3	41.4	8.0	396.2	492.9
Lower Clark Fork	75.9	35.8	4.8	534.4	650.9
Upper Clark Fork	82.0	39.7	4.1	412.0	537.8
Study Area	205.2	116.9	16.9	1342.6	1681.6

Source: Recreation Committee--Pacific Northwest River Basin Commission with adaptations by the River Basin Planning Staff 1970

TABLE V-22--ANALYSIS OF CAMPING AND CAMPING FACILITIES
CLARK FORK OF THE COLUMBIA RIVER BASIN

	Subareas			
Concept	Flathead	Lower Clark Fork	Upper Clark Fork	Total Study Area
1. Use in 1970 in thousands of camping occasions	492.9	650.9	537.8	1681.6
2. Design load for the number occasions on any day of year (12%)	5,986	7,904	6,532	20,422
3. Camp units needed for size standard of four occasions per camp unit	1,497	1,976	1,633	5,106
4. Camp units available				
Public	1,339	684	365	2,388
Private	3,064	763	634	4,461
Total camp units available	1,949	1,447	999	6,849
5. Ratio of camp units available to camp units needed	2.94	0.73	0.61	1.34

Source: River Basin Planning Staff

Energy Sources and Development

The primary source of energy in the basin is from hydroelectric dams and associated power transmission lines. The potential for hydroelectric development in the basin is substantial. Table V-23 and map V-18 show the existing and potential facilities and their capacities.

TABLE V-23--HYDROELECTRIC PLANTS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Name	Owner 1/	Date of Acquisition or Completion	Name Plate Capacity 2/	Reservoir Capacity
			(Megawatts)	(Acre-Feet)
Big Creek	FIP	1915	0.36	65
Flint Creek	MPC	1935	1.1	23,300
Milltown	MPC	1929	3.0	300
Bigfork	PPL	1930	4.26	No storage
Thompson Falls	MPC	1929	30.0	15,000
Kerr	MPC	1938	168.0	1,217,000
Noxon	WWP	1960	230.0	380,000
Hungry Horse	BR	1953	285.0	3,468,000

1/ MPC = Montana Power Company
PPL = Pacific Power & Light
BR = U. S. Bureau of Reclamation
FIP - Flathead Irrigation Project
WWP = Washington Water Power Company

2/ Name Plate Capacity is maximum generation capacity with adequate storage.

In addition to hydroelectric facilities, several natural gas and crude oil pipelines pass through and serve the region. Potential geothermal sites exist at eight thermal springs in the basin. They are

Hot Springs (Camas) in the Flathead subarea; Paradise, Lolo, Medicine, Gallogly, and Sleeping Child in the Lower Clark Fork subarea; and Gregson and Warm Springs in the Upper Clark Fork subarea. Exploration has been conducted only at Hot Springs where an unsuccessful attempt was made to reach geothermal temperatures.

Air Resources

Except for a few areas, air is relatively unpolluted. Air resources were discussed in chapters III and IV.

Visual Resources

Azure lakes, clear streams, verdant forests, and craggy peaks with scattered glaciers provide scenery for residents and attract visitors from throughout the nation and many foreign countries. Many of these visitors return as residents and land speculators with views of retirement and capitalization of natural beauties. A steady influx of new residents and a prospect of more to follow provide a supply of labor that holds wages at a lower level than most of the rest of the nation and also increases local unemployment rates. Paradoxically, the increase in population, automobiles, horses, and pets changes the natural environment that was instrumental in attracting those new residents. As a result, conflicts arise between those who want to stop development and those who want to capitalize on the scenery or create additional opportunity for employment.

Historical and Archeological Resources

Abundant water and diverse vegetation, coupled with relatively mild winters in some valleys, have attracted inhabitants for as long as 8,000 years. Evidence of early man is known from the 455 inventoried historical and archeological sites within the basin.[1/] Of this total, 12 are listed in the Federal Register, about half are located on private land, and about one-fourth are located on federal and state lands, with the remaining located on Indian tribal or other land. Map VI-19 shows the approximate location of publicly known sites.

The basin has had little archeological recognition, even though finds indicate inhabitants lived in the area shortly after glacial Lake Missoula dried up[2/]. Early man lived near the lakes and streams. These early inhabitants moved about the valleys to seek food. Since they established no large permanent settlements, it is very difficult to reconstruct their history.

Archeological finds in the area consist mostly of scattered subsurface lithic tools, pictographs, burial sites, and a few tipi rings. Scarred trees tell the story of how Indians peeled the bark from them to harvest the cambium layer for food. Sacred medicine trees where early man left his offerings are still standing. Some vision quest sites may still be identified by circles of rocks or constructed rock walls.

[1/] Files of the Statewide Archeological Survey, University of Montana, Missoula, Montana

[2/] Archeology in Montana, Volume XII Number 4, 1971; Montana Archeological Society, Missoula, Montana.

The St. Mary's Mission near Stevensville and the St. Ignatius Mission at St. Ignatius were established by Catholic missionaries in the late 1800's. The chapels are still standing. Paintings in the St. Ignatius Mission are well preserved and beautiful.

Cantonment Stevens (later known as Fort Owen) near Stevensville was the first Army post established in the state.

Mullan Road is an old wagon route which wound its way down the streams of the western slopes of the Clark Fork River, then up the St. Regis River to Mullan Pass. This was the route of thousands who traveled to and from the Pacific Northwest.

Relationship of Resource Base to Objectives

The objective components identified in chapter III are related to the resource discussed above in the following manner:

(1) Basic employment is closely associated with the extractive industries of mining, forestry, and agriculture which depend on available natural resources. As these natural resources are used up or become unavailable, basic employment in extractive industry is expected to decline.

(2) Potentials for reducing flood damages are limited by availability of adequate storage sites and the high cost of other structural measures. In some cases, structural measures are not acceptable by the public. Structural and nonstructural measures can be used to reduce impacts of flood damages.

(3) Type I and II drainable wetlands have a potential for improved agricultural production.

(4) Present irrigated acreages have potential for increased production through improved irrigation practices and additional late season water. Potentially irrigable land might be irrigated to produce more food and fiber.

(5) Water supplies are available to provide adequate water to all communities.

(6) Natural resources are available to adjust rural recreational facilities to meet changes in public preferences.

(7) Availability of local matching funds is the main limiting factor in development of urban recreational facilities.

(8) Private recreation facility imbalance will tend to adjust itself as some noneconomical units go out of business.

(9) Many good potential sites exist for developing additional access to public land and fishing water.

(10) Potential sites for improved boat ramps and floating docks have been identified on 11 reservoirs.

(11) Production can be increased through land treatment on 302,000 acres of irrigated land; 1,000,000 acres of range; and 4,200,000 acres of commercial forest.

(12) Damage to 84,000 acres of "other" lands can be reduced through land treatment and management.

(13) There is a physical potential to increase saw-timber production by 1,853 million board-feet.

(14) There is a potential to produce 169 million cubic feet of lower quality wood.

(15) A potential exists to more completely manufacture wood products within the basin rather than export lumber and plywood in its raw material state.

(16) Several hydroelectric power sites are available with ample water for more in-basin power generation.

EXISTING PROGRAMS

Many federal, state, and local agency programs and projects provide technical services and financial assistance to meet resource management and development needs in the basin. The public needs to be more aware of services and assistance available through these agencies and the degree to which these programs can be used to meet their needs.

(1) In relation to maintaining food and fiber production and basic employment from existing natural resources, one aspect lies in slowing the shift of agricultural and commercial forest land into subdivisions. Montana Department of Community Affairs is responsible for developing guidelines which are administered and enforced by regulations at the city and county level. Land use planning decisions are made at the local level. RC&D programs try to develop new manufacturing and employment opportunities.

(2) Structural flood damage reduction programs are available through the Corps of Engineers on major drainages and through the Soil Conservation Service on small watersheds. Under these programs, the Corps has constructed levees near Plains, St. Regis, and Missoula. A major levee project is also being planned for the Flathead River near Kalispell. The Corps has also provided flood-fighting assistance and emergency dike protection during past floods on the Bitterroot, Clark Fork, and Flathead Rivers.

Under the Soil Conservation Service small watershed program, one project has been completed on Cedar Creek near Columbia Falls. Three additional applications for projects on other watersheds have been made but are now in an inactive status.

Both the Corps and the SCS conduct flood plain delineation studies in conjunction with the state flood plain management program and with the HUD flood insurance program. The USGS and private engineering consultants are also often contracted by HUD to perform such studies. Flood plain studies for the state program have been completed by the Corps for the Clark Fork River from Missoula to Alberton; the Flathead River from Columbia Falls to Kalispell; Cottonwood Creek in Deer Lodge; and a five-mile portion of Lolo Creek near Missoula. Other flood plain studies have been completed for the Bitterroot River from Missoula to Darby and the Clark Fork River from Missoula to near Bearmouth by the University of Montana Department of Geology; and for Rock Creek in Missoula and Granite Counties by the USGS and the Montana Department of Natural Resources and Conservation.

Flood plain studies are presently under way on a five-mile portion of Rattlesnake Creek near Missoula (Corps) and for Warm Springs Creek near Anaconda (SCS). Both of these studies should be completed by July 1976.

Private consultants have recently been contracted by HUD to do detailed flood plain studies for drainages within Missoula, Silver Bow, Flathead, and Lincoln Counties. All these studies are scheduled for completion by 1978.

Comprehensive flood plain regulations under the Montana Floodway Management and Regulation Act are presently in effect for the Clark Fork River from Missoula to Alberton, the Bitterroot River from Missoula to above Darby, Rock Creek from its mouth upstream to the junction of East and West Forks, and Cottonwood Creek within the Deer Lodge city limits. Limited flood plain land use regulations are also presently in effect in Philipsburg, Butte, Anaconda, Columbia Falls, Whitefish, and the unincorporated areas within Flathead and Lewis and Clark Counties. Flood insurance is presently available in Butte, Philipsburg, Anaconda, Missoula, Missoula County, Columbia Falls, Whitefish, Flathead County, and Lewis and Clark County.

(3) Drainage of high water table areas is possible under Conservation District programs with technical assistance provided by SCS. About __________ acres have been drained to date and about ___________ more acres of Type I and II wetlands are expected to be drained by 1990.

(4) Irrigation water improvement projects have been built by the Bureau of Reclamation, the Water Resources Division of the Montana Department of Natural Resources and Conservation (formerly the Montana Water Resources Board), Soil Conservation Service, and private irrigation companies. Bureau accomplishments, partly under its old name of Reclamation Service, included the development of the Flathead Irrigation Project in Lake, Missoula, and Sanders Counties in 1907-1911, which was later turned over to the BIA in 1924. In 1930 the Bureau rehabilitated and enlarged the facilities of the Bitterroot Irrigation District and further rehabilitation was undertaken in 1936, 1948, and 1956. In 1935, the Bureau constructed the Frenchtown Irrigation Project near Missoula and in 1939 built the Big Flat Unit of the Missoula Valley Project.

The MDNR&C administers five irrigation developments in the basin. In Granite County, the MDNR&C built the project now operated by the Flint Creek Water Users Association, which includes a storage reservoir on the East Fork of Rock Creek and canal systems in the lower Flint Creek drainage. In Powell County, the Department built the project now operated by the Nevada Creek Water Users Association near Helmville in the Blackfoot River drainage. This latter project consists of the Nevada Creek Reservoir and a system of delivery canals. In Ravalli County, the MDNR&C owns a water storage project on the West Fork of the Bitterroot River about 40 miles south of Darby. This project, called Painted Rocks Reservoir, has 31,704 acre-feet of capacity and was built to supply water to irrigators diverting water out of the Bitterroot River as far downstream as Missoula. The only repeated annual sale of the stored water has been to the Department of Fish and Game for the purpose of regulating stream flows for fisheries. The Department's Fred Burr Creek project has a 515 acre-feet reservoir and provides supplemental water to 835 acres operated by the local water users association. The Ravalli Water Users Association (Daly Ditch Project) was conveyed to the MDNR&C on October 1, 1942. The project consists of several irrigation canals and three small storage reservoirs. Most of the water of this project comes from the Bitterroot River. The project has a total of 12,000 acres irrigated on over 300 farms and tracts.

The Renewable Resource Development Loan Program initiated in 1976 by the MDNR&C makes two and one-half percent of the Montana Coal Tax available for loans to farmers and ranchers in Montana for irrigation development, forest management, and fish and wildlife improvement.

It is estimated that an increasing amount of money will be available for developing wells and irrigation systems, repairing reservoirs and ditches, improving forest practices, establishing permanent pastures and farm forests, developing fish production structures, constructing erosion-control structures, and leveling land.

In addition, the Technical Assistance Program of MDNR&C will assist local groups by completing preliminary (prefeasibility) investigations of proposed multipurpose water and related lands development projects. This program is intended to initiate water development projects designed for domestic, municipal, industrial, irrigation, fish and wildlife, recreation, flood control, water quality maintenance and improvement, drainage, and sediment and erosion control.

The Soil Conservation Service built the Lower Willow Creek PL-566 project in Granite County in 1962 and has received seven other applications for PL-566 assistance on irrigation projects. Under PL-46 programs, __________ miles of irrigation canals have been lined. RC&D project measures have included _________ miles of canal rehabilitation and ____________ acre-feet of irrigation water storage.

(SCS POTENTIAL ACTIVITIES TO BE ADDED LATER)

Private irrigation companies were the original developers of most of irrigated land in the basin. Most of the development in the past decade has been by individual farmers or small private groups; this pattern is expected to continue with the availability of state and federal assistance.

(5) Community water supply development assistance is available for smaller communities through programs of the Farmers Home Administration and for larger cities under programs of HUD. Little use has been made of these programs in the basin.

(6) Recreation facilities on public land were developed under programs of the National Park Service, Forest Service, and Montana Department of Fish and Game. These programs will continue to supply diverse recreation opportunity.

(7) Recreation facilities for urban communities are developed in cooperation with Bureau of Outdoor Recreation programs directed through Montana Department of Fish and Game and have resulted in $ invested through 1975. This program is expected to continue as state and local funds become available.

(8) Advice to private recreation developers is available through SCS, Cooperative Extension Service, and Small Business Administration.

(9) Forest Service programs could provide 20 additional access points to public land by 1990. Fish and Game programs could provide 21 more fishing access points to streams and lakes by 1990.

(10) BOR programs directed through the Montana Department of Fish and Game could be used to develop boat ramps and floating docks on five reservoirs by 1990.

(11) PL-46 land treatment programs under the ASCS and SCS have improved production on __________ irrigated acres and __________ range and will improve production on __________ irrigated acres and __________ acres of range by 1990. Forest land treatment will improve timber production on __________ acres of national forest land and __________ acres of private commercial forest land by 1990.

(12) Erosion damage has been reduced through land treatment under PL-46 programs on ________ acres of "other" lands and will be reduced on ________ acres by 1990.

(13) Under current rates of application of forestry programs for thinning and harvest, total production would decrease to 105,600,000 cubic-feet by 1990 and 95,600,000 cubic-feet by 2020.

(14) Forest product technology under current rate can be improved by private enterprise with state Forest Service assistance to increase use of lower quality woodto 3,400,000 cubic-feet by 1990.

(15) Private enterprise could increase the manufacture of more complete wood products and increase basin employment by 1990. RC&D programs and Small Business Administration can assist in this endeavor.

(16) The largest private water development projects in the basin are hydroelectric projects on the Flathead and Clark Fork Rivers. These include Kerr Dam, 1,219,000 acre-feet; Noxon, 380,000 acre-feet; Thompson Falls, 69,400 acre-feet; and Cabinet Gorge, with its dam in Idaho and its storage pool mostly in Montana. Other power dams are at Milltown, Bigfork, Georgetown, and Big Creek. Hungry Horse Reservoir dominates federal agency power generation efforts and accomplishments in the

basin. The 3,668,000 acre-feet of storage provide flood prevention, irrigation, and power generation. Counting dual purpose capacity, there are 2,982,000 acre-feet useable for flood prevention storage. However, the most significant benefits derive from the power generation and regulating effect on downstream reservoirs. Most of the power generated is used by the Anaconda Company plant near Columbia falls. The aluminum plant provides a significant part of the employment of Flathead County.

Bonneville Power Administration has the responsibility for coordination of public power transmission in the Pacific Northwest while the Corps of Engineers and Federal Power Commission will be the major agencies having input in future project development in the basin.

Utility companies and even the Confederated Salish-Kootenai Tribes may be involved in private power development in the future.

ENVIRONMENTAL

(1)(2) Erosion and sedimentation problems have been addressed by many agencies. Under authority of PL-46, the Soil Conservation Service provides technical service through the direction of the local Conservation Districts.

The SCS has provided technical assistance for erosion protection on __________ acres of cropland, ____________ acres of rangeland, ________ acres of other lands, and __________ miles of streambank protection. Without an accelerated program, the SCS could provide assistance for additional erosion control on ___________ acres of cropland, ________ acres of rangeland, ________ acres of other lands, and ________ miles of streambank protection by 1990.

ASCS has provided and may provide financial assistance.

The U. S. Forest Service has provided erosion control for ________ acres of forest land and ________ miles of streambank, roads, and other problem areas on lands it controls. With continued ongoing rates, it could provide erosion protection on ________ acres of forest land and ________ miles of streambank, roads, and other areas by 1990.

Other agencies such as the Bureau of Land Management, the Bureau of Indian Affairs, the National Park Service, the Fish and Wildlife Service, and the Montana Department of State Lands have provided erosion and sedimentation management on lands over which they have administrative control.

(3) Federal cost sharing to communities under PL-92-500 is allocated under a statewide priority system administered by the Montana Department of Health and Environmental Sciences and the Environmental Protection Agency. Approximately $________ of cost sharing funds have been used to upgrade ________ sewage facilities in local communities. Based upon current funding levels, approximately $________ of cost sharing funds could be shared with ________ communities for improving sewage treatment facilities by 1990. Industrial waste treatment is regulated by the Montana Department of Health and Environmental Sciences, with Environmental Protection Agency assistance.

(4) Irrigation water management helps to control water pollution by a decrease in the amount of irrigation return flows and runoff.

Approximately __________ acres of irrigation water management have been achieved with technical assistance from the Soil Conservation Service and financial assistance from the Agricultural Stabilization and Conservation Service. Based upon present levels of funding and cost sharing, about ________ acres of irrigation water management could occur by 1990.

(5) Air pollution is regulated by the Montana Department of Health and Environmental Sciences, with assistance from the Environmental Protection Agency.

(6) Control of water fluctuations on reservoirs is under the management of the agency or individual responsible for the particular reservoir. The Army Corps of Engineers, the Bureau of Reclamation, the Bonneville Power Administration, the Montana Department of Natural Resources and Conservation, and private irrigation companies currently control reservoirs for the express purpose of irrigation and power generation. Management of these reservoirs for scenic beauty is not anticipated.

(7) Protection of vegetation along rivers and streams has not been under the control of any agency or land management group. Partial accomplishment of this goal may be accomplished by: scenic and wild rivers designation; streambank protection laws such as SB-310 under the direction of the Soil and Water Conservation Districts; the Corps of Engineers "section 404" and "section 10" permits; and stream hydraulic permits which are issued by the Montana Department of Fish and Game. Approximately 81,000 acres of vegetation may be protected by 1990 by wild and scenic river designation.

(8) Additional access to public lands is needed to alleviate crowding of existing access sites. The U. S. Forest Service has provided _______ access sites and could provide ______ additional access sites by 1990.

(9) Control and management of land for protection of open and green space have been partially accomplished in recent times by various laws and land use practices. Zoning regulations are beginning to have some impact on the urban sprawl problem, and management agencies are becoming increasingly aware of open and green space and scenic beauty as a component of integrated land management.

(10) Preservation of all presently free-flowing streams would require the prevention of any new dams.

(11) Road and utility line placement and construction on public land is presently regulated under law. Most utility line placement is regulated by the Montana Major Facility Siting Act. Construction of roads and other structures by federal and state agencies requires preparation of environmental impact statements. Additional regulation may develop for the preservation of environmental quality.

(12) Minimum streamflows for fish and wildlife are presently not being maintained. Fish and wildlife became beneficial users of water under the 1973 Montana Water Use Act, and reservations of water can now be filed for these purposes. On many small streams where dewatering is a problem, all existing water has been allotted for irrigation purposes and a reservation of water would be impractical. It is anticipated that a small watershed project could provide minimum streamflows in

32 miles of stream by 1990.

(13) Modification of Hungry Horse Dam and its operation to provide stabilization of extreme flow and temperature fluctuations would be under the authority of the Department of the Interior, Bureau of Reclamation. There is not a completed plan for these modifications.

(14) Management of big game, upland, and wetland wildlife habitat has been partially accomplished by various agencies. The Montana Department of Fish and Game has purchased or leased approximately 69,000 acres of big game winter range. At current funding rates, an additional 50,000 acres could be under their management by 1990.

Upland habitat management occurring on private land has been partially accomplished by various agencies. The Montana Department of Fish and Game has purchased or leased approximately 69,000 acres of big game winter range. At current funding rates, an additional 50,000 acres could be under their management by 1990.

Upland habitat management occurring on private land has been partially accomplished by ASCS cost-share funding with SCS technical assistance. About 600 acres of shelterbelts and wildlife areas have been installed and managed. At current rates, another 300 acres of shelterbelts and wildlife areas could be installed by 1990. Approximately 3,200 acres of upland game management areas have been purchased or leased by the Department of Fish and Game. Based upon the present federal-state cost-share structure, an additional 2,500 acres of upland wildlife habitat could be purchased or leased by 1990.

Preservation of wetland areas is being partially accomplished by purchase and/or lease of those areas showing the most promise as waterfowl production areas. Approximately ________ acres of wetland and adjacent uplands have been purchased by the Montana Department of Fish and Game. Approximately ________ acres of wetland and adjacent uplands have been purchased by the U. S. Fish and Wildlife Service. Based upon past purchases, about ________ acres of wetland could be purchased or leased by the Montana Department of Fish and Game by 1990, and about ________ acres of wetland could be purchased by the U. S. Fish and Wildlife Service by 1990.

(15) Recent structures which have been constructed in streams have generally been designed with fish passage. Provision of fish passage around existing stream blockages is the responsibility of the company or agency which owns or controls the dam. There is no program to provide fish passage around existing stream blockages.

(16) There are over 250 pieces of federal legislation which affect historic preservation in some way. The federal act which probably brought about the greatest changes is the National Environmental Policy Act of 1969, (P. L. 91-190, 83 Stat. 852), which requires all agencies to consider the impact of any proposed federal action on the quality of the natural environment. This includes any federally funded or federally licensed activities. Federal matching grants are available to the state, the National Trust, cities, and counties to survey and preserve historical and archeological sites.

The Montana Environmental Policy Act requires all state agencies to evaluate the impact of any proposed state action on the quality of the natural environment. Montana laws give the Fish and Game Commission certain powers for the purpose of inventorying and protecting our historical and archeological sites. Many of the inventories in the past have been done in haste in order to stay ahead of construction projects. Pictographs usually are in the most danger of destruction, as they are the most visible. Although we have laws to protect our disappearing heritage, sufficient funding and manpower have not been provided to enforce the laws.

CHAPTER V--SUMMARY TABLE--RESOURCE BASE AND EXISTING PROGRAMS

	Resource Base	Existing Programs (if continued through 1990)
	Resources Related to NED Objectives:	Program Accomplishments Related to NED Objectives:
1.	A. Minerals-based employment declined from ______ in 1960 to ______ in 1975. Commercial forests declined from ________ acres in 1960 to ________ acres in 1975. From 1960 to 1975, __________ acres of agricultural land moved into subdivisions. B. Potential for preserving most productive agricultural and commercial forest land in present production.	Minerals employment will continue to decline. State and county agencies have sloed subdivision of agricultural and commercial forest land to amount shown needed. Strict enforcement of "shown need" concept can effectively stop further subdivision until present lots are built up.
2.	A. Existing flood damage on _________ acres of agricultural land and __________ acres of residential and urban land. B. Potential for reduction of flood damages on __________ acres.	Corps's upper Flathead project would reduce damages on _______ agricultural acres and __________ residential acres. HUD flood plain insurance program will alleviate financial impact on ________ residential acres.
3.	A. High water table problems on 90,000 acres of reclaimable lands B. Potential to reclaim 90,000 acres.	SCS programs could assist drainage on _________ acres by 1990.
4.	A. Existing irrigated 431,700 Ac. use _________ acre-feet, including 208,000 ac. short ___________ acre-feet. B. Potential irrigable land _________ acres. From direction diversion _________ acres would use ___________ acre-feet. From stored water __________ acres would use _________ acre-feet.	PL-566--One project to store __________ acre-feet to supplement irrigation on _________ acres. RC&D--4 project measures to increase transmission to ___________ acres. PL-46--assist development of ___________ acres new private irrigation and assist conversion of _____________ acres conventional irrigation to sprinkler irrigation.

CHAPTER V--SUMMARY TABLE--RESOURCE BASE AND EXISTING PROGRAMS

	Resource Base	Existing Programs (if continued through 1990)
	Resources Related to NED Objectives:	Program Accomplishments Related to NED Objectives:
5.	A. 17 communities need better water supplies or supply systems. B. Potential supplies of water are available for all communities depending on costs.	Farmers Home Administration programs will assist ______ small communities in upgrading supply systems. HUD programs will assist _____ larger cities in upgrading their water supply systems.
6.	A. Existing facilities not of proper type and location for current preferences. B. Potential for gradual relocation and redesign.	Changing policies on public recreation facilities may substitute more management for physical investment.
7.	A. Many communities short of some types of recreational facilities. B. Potential for facility development as funds become available.	BOR programs can assist with technical and financial assistance depending on local matching funds and initiative. May provide ______ percent of facilities needed.
8.	A. Many private recreational facilities losing money. B. Potential for better economic and technical advice.	Many unneeded units will go out of business. Better economic advice will tend to prevent further unwise investment.
9.	A. Additional access points needed to public land, streams, and lakes. B. Potential access sites exist.	Forest Service programs could provide _______ new access points. Fish and Game program could provide _______ new fishing access points.

	Resource Base	Existing Programs (if continued through 1990)
	Resources Related to NED Objectives:	Program Accomplishments Related to NED Objectives:
10.	A. Improved boating access facilities needed on fluctuating reservoirs. B. Sites on ____ reservoirs could be developed.	BOR programs might be used to develop ____ boating accesses.
11.	A. Lower than potential production on 302,000 acres of irrigated land. 1,000,000 acres of range 2,600,000 acres of commercial forest B. Potential to increase yields from: 25 to 100 percent on irrigated land up to 75 percent on rangeland up to ____ percent on commercial forest	PL-46 land treatment will increase production on ____ irrigated acres and ____ range acres. Forest land treatment practices will increase production on ____ acres.
12.	A. Erosion damaging 84,000 acres of "other" lands. B. Potential for stopping erosion with land treatment practices	____ acres of "other" lands adequately protected.
13.	A. Need to provide ____ cubic-feet of sawtimber by 1990 and ____ cubic-feet by 2020. B. Potential to increase growth on ____ acres of commercial forest.	Forestry programs for thinning and selective harvest could increase sawtimber by ____ cubic-feet and ____ cubic-feet by 2020.
14.	A. Need to use more of available lower quality wood now wasted. B. Potentially ____ cubic-feet per year now available.	Plant technology is available to increase use by ____ cubic-feet if market conditions permit.

CHAPTER V--SUMMARY TABLE--RESOURCE BASE AND EXISTING PROGRAMS

	Resource Base	Existing Programs (if continued through 1990)
	Resources Related to NED Objectives:	Program Accomplishments Related to NED Objectives:
15.	A. Need for more complete manufacturing of wood products to provide more local employment. B. Most wood products leave the basin as lumber or plywood rather than completed products.	Potential for increased manufacturing to increase employment by ________ man-years by 1990 and by ________ man-years by 2020, provided market and freight conditions are favorable.
16.	A. Basin imports electricity and will need to import more in future. B. Several hydroelectric power sites are available with ample water.	Combination of private power company and Indian Tribal Council may develop two run-of-river sites below Kerr Dam.

CHAPTER V--SUMMARY TABLE--RESOURCE BASE AND EXISTING PROGRAMS

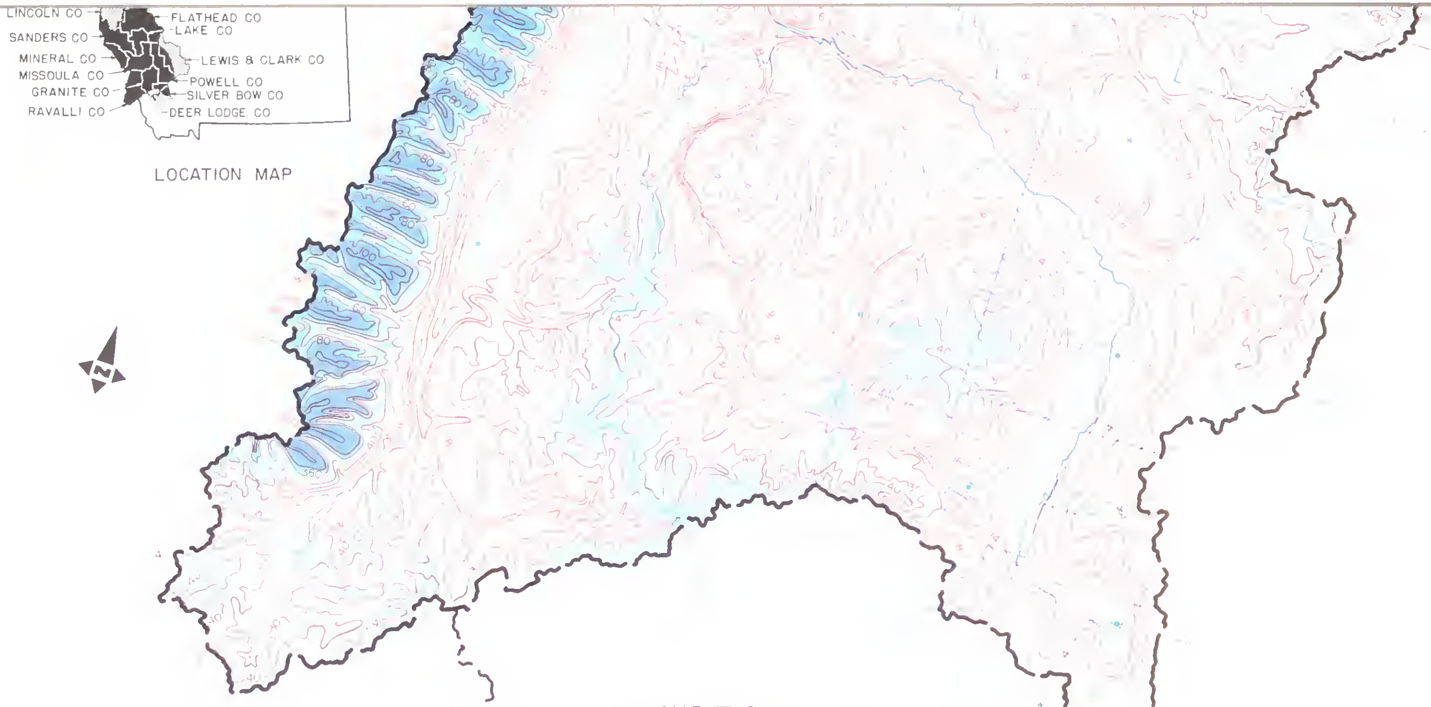
	Resource Base	Existing Programs (if continued through 1990)
	Resource Related to EQ Objectives:	Program Accomplishments Related to EQ Objectives:
1 & 2	A. Existing erosion and sediment problems Land Use Cropland 173,000 acres Rangeland 1,000,000 acres Forest land 62,000 acres Other 84,000 acres Streambank, roads, etc. 2,552 miles B. Potential for 1,319,000 acres and 2,552 miles of erosion control.	SCS could assist with erosion sedimentation problems on _____ acres of crop, range, and other lands, and _____ miles of streambank by 1990. Forest Service could assist with _____ acres of forest land and _____ miles of trails, roads, and gullies.
3.	A. Sewage treatment facilities for 41 sites. Industrial waste treatment on 9 sites. B. Potential for no water pollution aspect.	_____ could assist with construction of _____ new facilities by 1990. _____ industry complying by law.
4.	A. Irrigation-water control for 431,700 irrigated land. B. Potential for water control on 431,700 acres of irrigated land.	SCS could assist with irrigation water control on _____ acres by 1990.
5.	A. Air pollution control on 6 sites. B. Potential for no air pollution.	Regulated by Montana Department of Health and Environmental Sciences with assistance by Environmental Protection Agency.
6.	A. Reduced water fluctuations of 4 reservoirs B. Potential for no fluctuations.	Essentially no program.
7.	A. Protected vegetation along 565 miles of streams and lakes. B. Potential for protection of 565 miles of vegetation.	The Forest Service may establish 250 miles of wild and scenic river areas.

CHAPTER V--SUMMARY TABLE--RESOURCE BASE AND EXISTING PROGRAMS

		Resource Base	Existing Programs (if continued through 1990)
		Resource Related to EQ Objectives:	Program Accomplishments Related to EQ Objectives:
8.	A. B.	Additional access to public lands. Potential for 39 additional access facilities.	The Forest Service could provide ______ access sites.
9.	A. B.	Protected open and green space. Potential for control of open and green space.	City and county zoning regulations could protect some open and green space.
10.	A. B.	Free-flowing streams. Potential for all streams to remain free flowing.	There is growing opposition to structures in streams and rivers, but new structures will be built.
11.	A. B.	Planned road and utility line location and construction. Potential for complete planning.	Existing laws require complete evaluation and public discussion concerning the construction of major road and utility lines.
12.	A. B.	Adequate minimum stream flows for ______ miles of stream. Potential for ______ miles of minimum stream flow.	Minimum stream flows may be provided for 32 miles of stream by a small watershed project.
13.	A. B.	Temperature control and reduced daily fluctuations of discharges from Hungry Horse Reservoir. Potential for temperature and fluctuation control.	No completed plan.

CHAPTER V--SUMMARY TABLE--RESOURCE BASE AND EXISTING PROGRAMS

	Resource Base	Existing Programs (if continued through 1990)
	Resource Related to EQ Objectives:	Program Accomplishments Related to EQ Objectives:
14.	A. Adequate big game, upland and wetland wildlife habitat. B. Potential of 1,420,000 acres of big game, 1,400 acres of upland and ________ acres of wetland habitat.	Montana Department of Fish and Game could provide ________ acres of big game habitat by 1990. Soil Conservation Service can assist with technical and financial assistance on ________ acres of upland habitat by 1990. The U. S. Fish and Wildlife Service and the Montana Department of Fish and Game could provide ________ acres of wetland habitat by 1990.
15.	A. Desirable fish migration B. Potential for circumvention of one existing barrier.	There is no program to remove structures which block fish passage.
16.	Protect historical, archeological, and cultural sites.	Laws exist, but funding and enforcement are inadequate.



MAP V-2

AVERAGE ANNUAL PRECIPITATION

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JULY 1976

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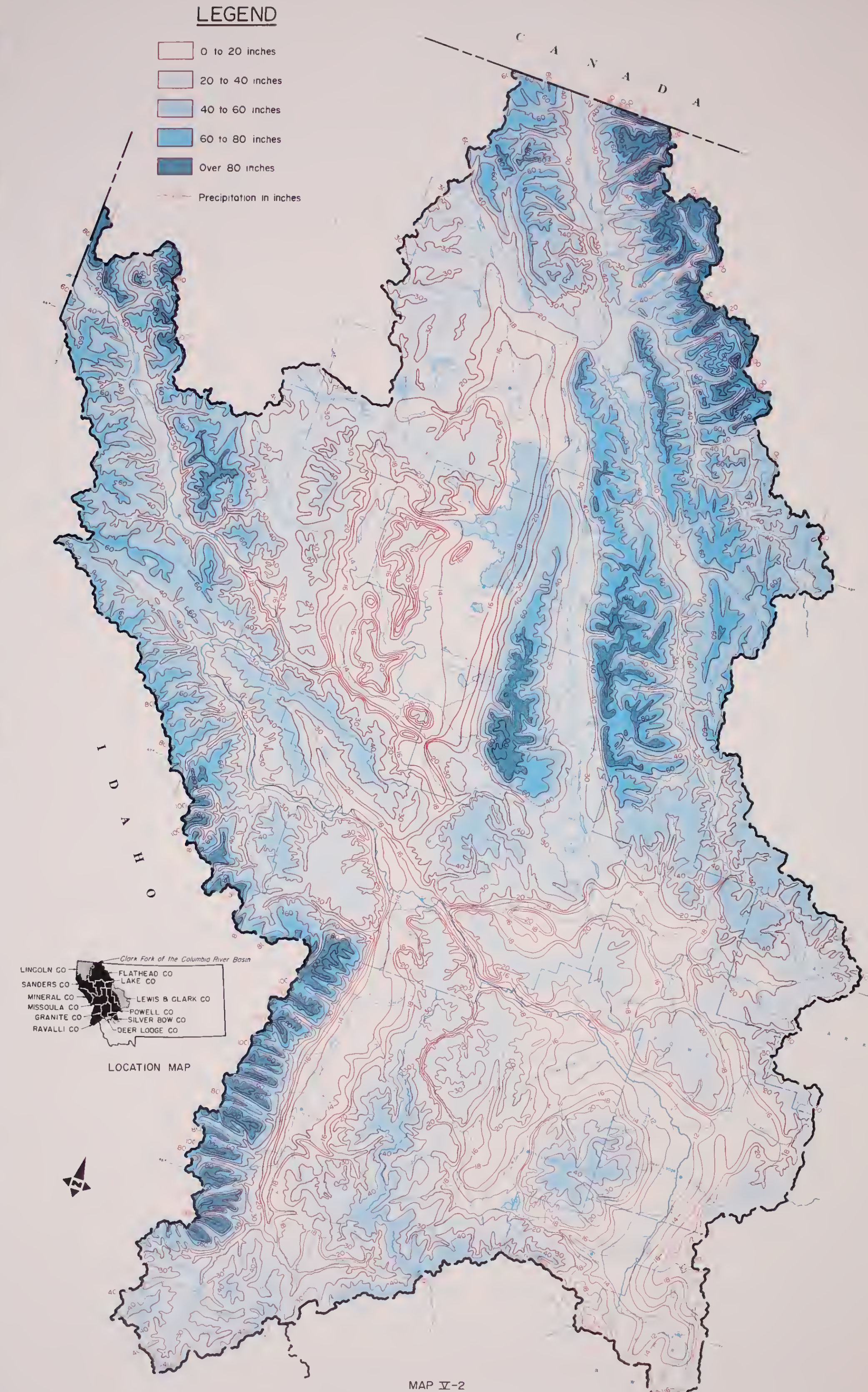

MAP V-2

AVERAGE ANNUAL PRECIPITATION

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JULY 1976

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US DEPARTMENT OF AGRICUL

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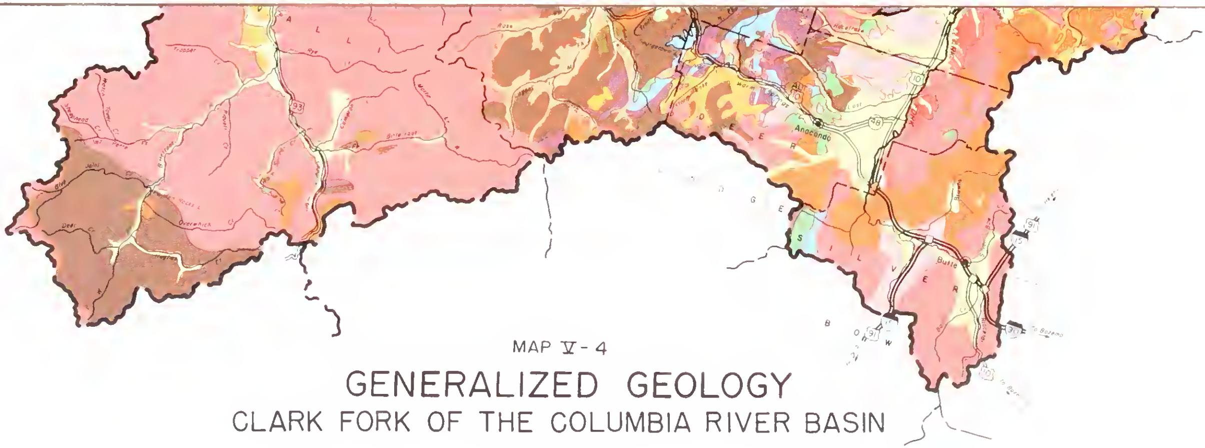

MAP V-4

GENERALIZED GEOLOGY

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JULY 1976

10 0 10 20 MILES

SCALE 1:1,000,000

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deposits. High permeability. Thicknesses range from 10-75 feet.

high and drained, however. Yields 5-200 gpm.

rtiary

CHAPTER V SUMMARY TABLE RESOURCE BASE AND EXISTING PROGRAMS

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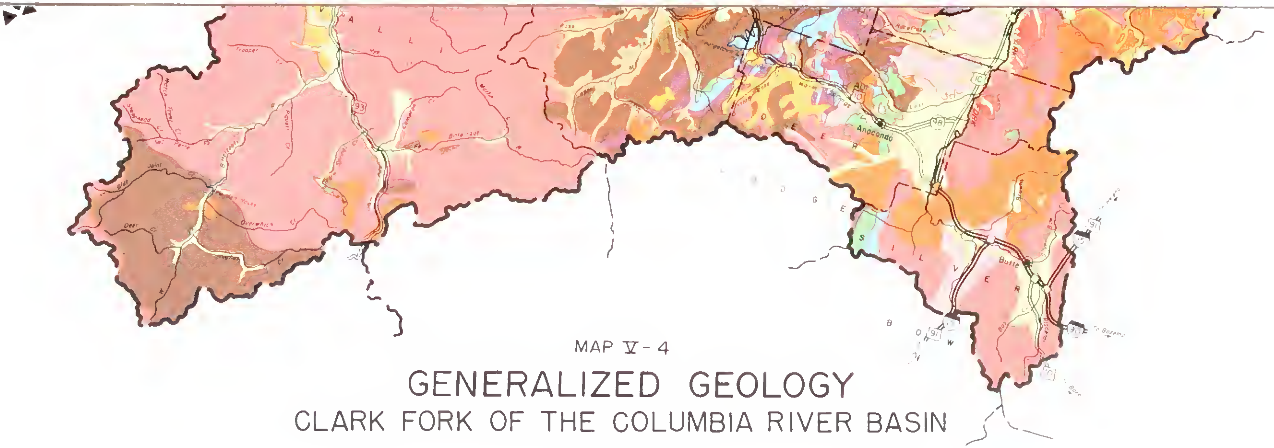

MAP V-4

GENERALIZED GEOLOGY

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JULY 1976

10 0 10 20 MILES

SCALE 1:1,000,000

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deposits. High permeability. Thicknesses range from 10-75 feet.

high and drained, however. Yields 5-200 gpm.

rtiary

LEGEND

Qal — ALLUVIUM

Qg — GLACIAL DEPOSITS UNDIFFERENTIAL

Qgm — GLACIAL MORAINE DEPOSITS

Qgs — GLACIOLACUSTRINE DEPOSITS

— GRAVEL DEPOSITS

Ts — TERTIARY DEPOSITS

TKv — VOLCANIC ROCKS

TK — INTRUSIVE IGNEOUS ROCKS

IP-Ku — PENNSYLVANIAN TO CRETACEOUS SEDIMENTARY ROCKS, UNDIFFERENTIATED

Mu — MISSISSIPPIAN, UNDIVIDED

— CAMBRIAN THROUGH DEVONIAN SEDIMENTARY ROCKS, UNDIVIDED

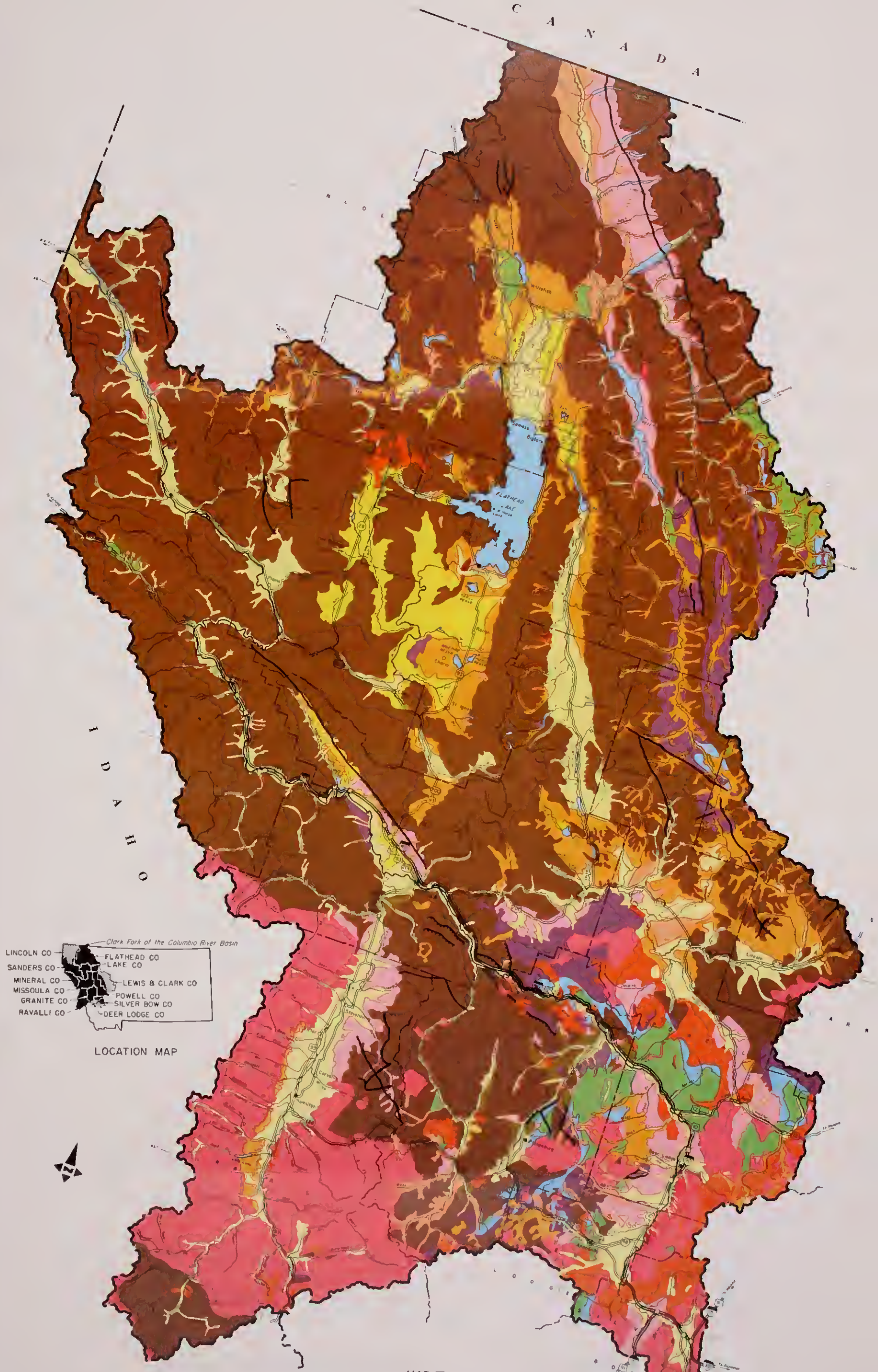
— PRECAMBRIAN ROCKS, UNDIVIDED

— FAULT

— THRUST FAULT

SEE OPPOSITE SIDE FOR A DETAILED EXPLANATION OF THE SYMBOLS USED ABOVE

Map and Explanation adapted from
Regional Planning Association of Western Montana, Phase 2 Report, May, 1973
Ross, Clyde P., Andrews, David A., Witkind, Irving J., 1955, Geologic Map of Montana, U.S. Geologic Survey in cooperation with the Montana Bureau of Mines and Geology
Experience of S.C.S. personnel in the field



MAP V-4

GENERALIZED GEOLOGY
CLARK FORK OF THE COLUMBIA RIVER BASIN
MONTANA

JULY 1976

10 0 10 20 MILES
SCALE 1:1,000,000

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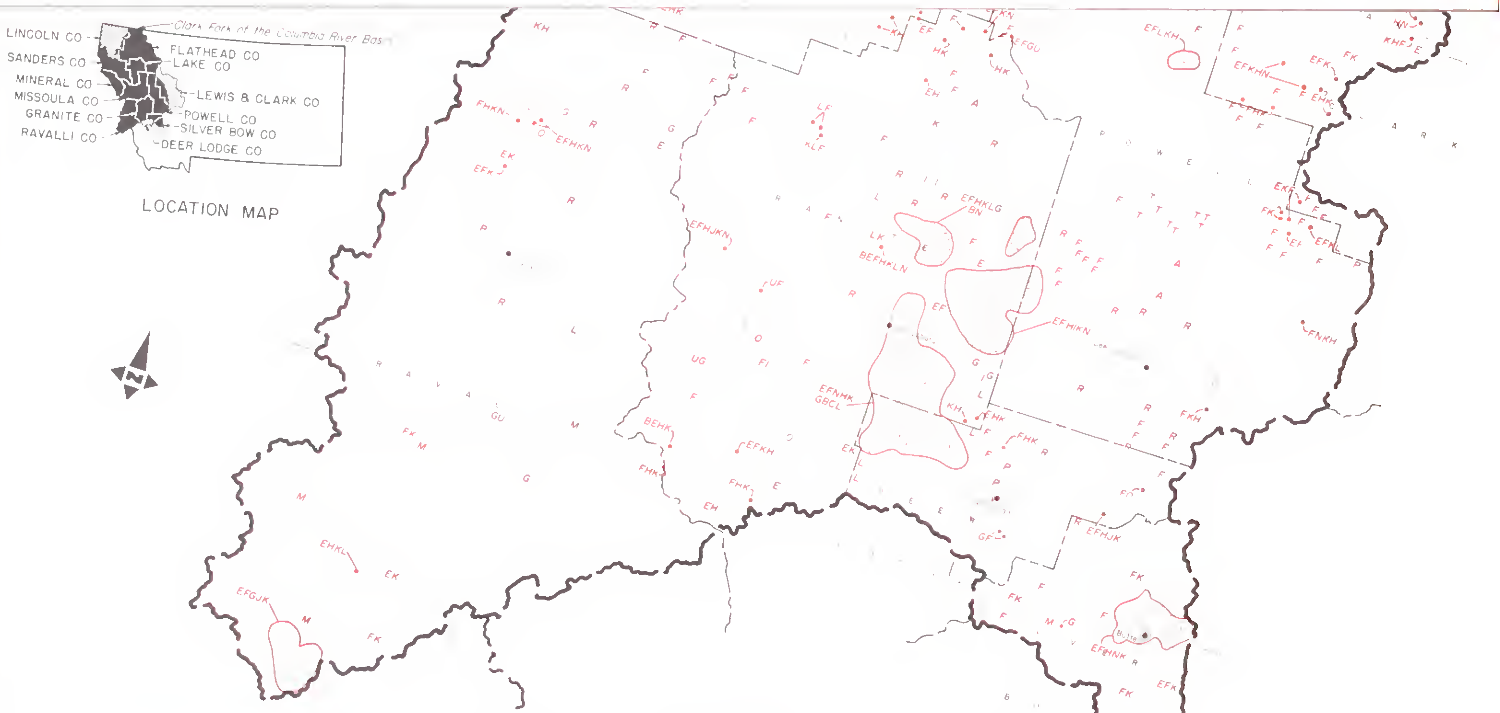
EXPLANATION OF SYMBOLS

		Formation Name and Description	Hydrologic Characteristics
Recent	Qal	Alluvium - Unconsolidated stream-deposited gravel, sand, silt, and clay. Occurs primarily along present-day coulees, creeks, and channels. Maximum depths found in the immediate flood plains of major rivers. Ranges in depth from 10-300 feet.	Yields adequate supplies of ground water for domestic and stock use. Locally, yields adequate supply for irrigation. Reported yields of 10-3000 gpm. This aquifer is particularly susceptible to pollution from surface sources.
	Qg	Glacial deposits-undifferential - Heterogeneous, unconsolidated sediments consisting of silt, sand, gravel, and cobbles, with minor amounts of clay and boulders. The product of alpine (high mountain) glaciation, these deposits are generally coarse and permeable. Range in depth from 10-90 feet.	Locally yields adequate water for domestic or stock use. Average yield of 3-15 gpm. This aquifer is sometimes situated so high in elevation that it is essentially drained.
Quaternary Pleistocene	Qgm	Glacial moraine deposits - Lateral, terminal, and ground moraines, consisting mainly of silt, sand, gravel, cobbles, and boulders. Usually very permeable, but of limited extent. Range in depth from 10-150 feet.	Locally yields adequate water for domestic or stock use. Usually these aquifers are of limited extent and high in elevation. However, Qgm in the valley of the North Fork of the Flathead River may be an important source of ground water. Average yields of 10-1000 gpm.
	Qgs	Glaciolacustrine deposits - Predominantly buff to pale pink silts and clays deposited in a fresh water lake environment. Unconsolidated and generally stratified. Erosive--may be highly gullied. Thickness of up to 100 feet.	Generally a poor aquifer with poor permeability. Locally yields adequate water for domestic and stock use. Yields 0-10 gpm.
Tertiary	Qr	Gravel deposits - Predominantly gravels with sandy matrixes which form high terrace deposits. High permeability. Thicknesses range from 10-75 feet.	Locally, yields adequate water for domestic and stock use. Terraces generally high and drained, however. Yields 5-200 gpm.
	Ts	Tertiary sediments - Unconsolidated to consolidated silts, clays, sand, and gravel. Minor sandstones, conglomerate, and boulders. Generally erosive, but varies.	Generally an adequate aquifer for domestic and stockwater supply. In many areas these sediments contain thick zones of channel sands and gravels which yield large supply of ground water. Yields 0-1500 gpm.
Cretaceous to Tertiary	TKv	Volcanic rocks - Extrusive rocks consisting mainly of flows and associated pyroclastic deposits. Generally resistant to erosion.	Low-yielding wells produce from fracture in upper zone. Fractures are extensive in the upper 100-150 feet. Average yields 2-10 gpm.
	TKi	Intrusive igneous rocks - Predominantly rocks of the Idaho and Boulder batholiths. Also stocks, dikes, and sills. Generally granitic in composition and texture, although many other compositions and textures are present. Generally massive, hard rock resistant to erosion.	Relatively impervious. Little or no water available in these materials. Water available only in highly jointed or fractured rock. Generally becomes more massive with depth. Not favorable for water wells unless the static water table is shallow.
Pennsylvanian to Cretaceous	₱-Ku	Pennsylvanian to Cretaceous sedimentary rocks, undifferentiated - The formation with greatest areal extent and thickness is the Colorado Shale. Includes also the Kootenai sandstone, the Morrison and Ellis group, the Phosphoria formation, the Quadrant quartzite, and other minor (in this context) formations. The Colorado shale is a dark-colored marine shale with a total measured section of approximately 2000 feet.	Shale zones are not considered good ground water sources. Sandstones and quartzites of the Kootenai, Phosphoria, and Quadrant formations are good aquifers. These zones are small in extent in the watershed area or are too deep to be considered good sources of ground water.
Mississippian	Mu	Mississippian, undivided - By far the dominant formation in this group is the Madison group. Predominantly limestones, in part dolomitic, with lesser amounts of sandstone and shale. Generally a massive and erosion-resistant formation. Cavernous in parts, especially the upper Madison section.	Upper portion of the formation is considered a good ground water aquifer. Yields vary from 0-1000 gallons per minute. Water quality is normally excellent for domestic and irrigation supply.
Cambrian through Devonian	D-Єu	Cambrian through Devonian sedimentary rocks, undivided - Includes Three Forks formation, Jefferson limestone, Maywood formation, Hasmark formation, Silver Hill formation, Park shale, Meagher limestone, Wolsey shale, Flathead quartzite. Shales, limestones, quartzites, and sandstones.	This section is normally hard and massive. Water transmissibility is low. Large yields can be obtained in fractured zones. Average yields 0-15 gpm.
	P-Єu	Precambrian rocks, undivided - Predominantly Belt Series metasedimentary rocks with a few pre-Belt metamorphic rocks. Argillites, limestones, quartzites, and shales.	Yields adequate supplies of ground water for domestic and livestock use. Water quality is moderately good. Yields range from 2-10 gpm.

Tertiary sediments - unconsolidated to   Generally an adequate aquifer for domestic



Source REPORTED OCCURRENCES OF SELECTED MINERALS IN MONTANA 1967

MAP V-5
GENERAL MINERAL RESOURCES
CLARK FORK OF THE COLUMBIA RIVER BASIN
MONTANA

JULY 1976

10 0 10 20 MILES

SCALE 1:1,000,000

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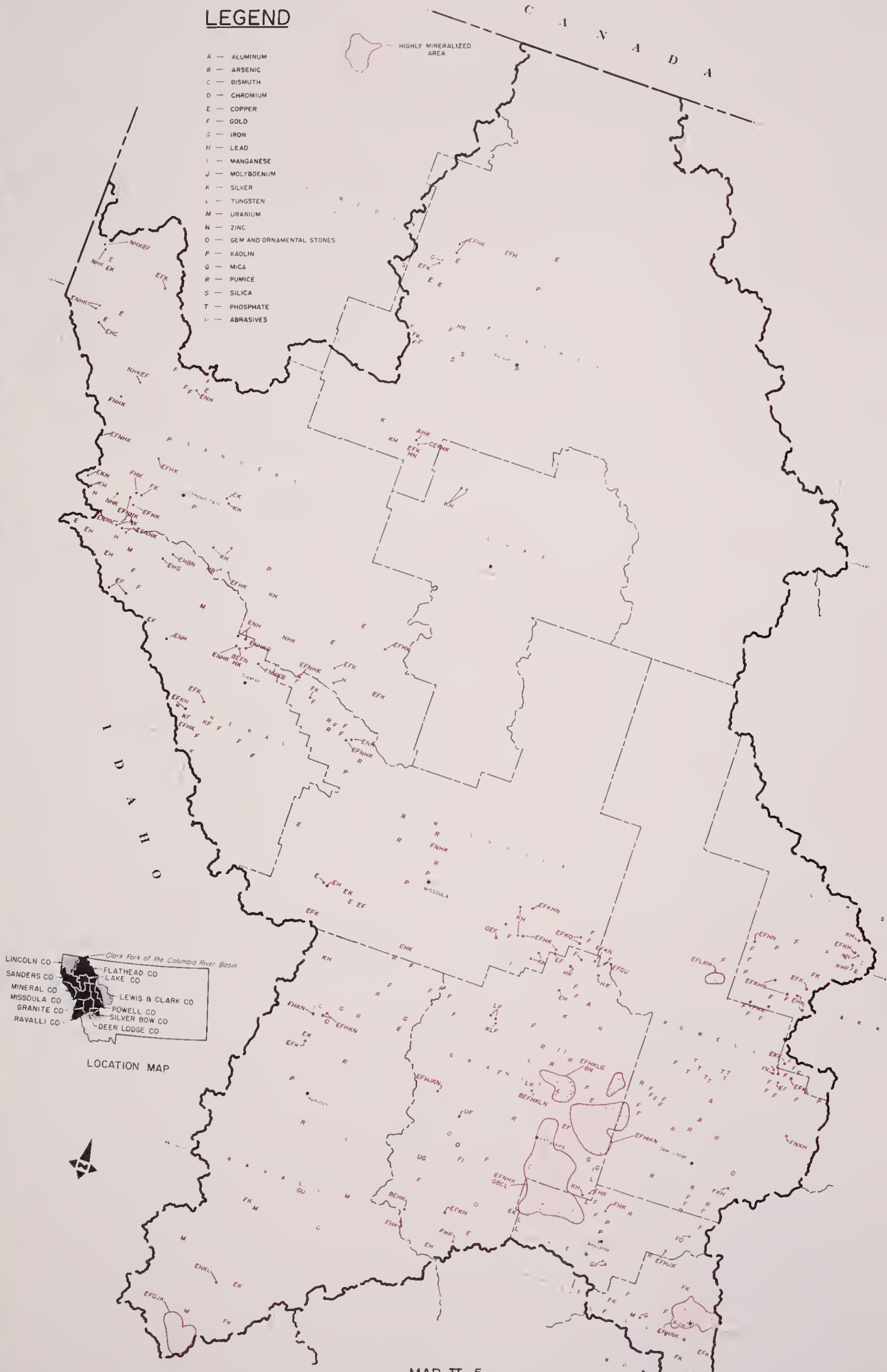

Source REPORTED OCCURRENCES OF SELECTED MINERALS IN MONTANA 1967

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GENERAL MINERAL RESOURCES
CLARK FORK OF THE COLUMBIA RIVER BASIN
MONTANA

JULY 1976

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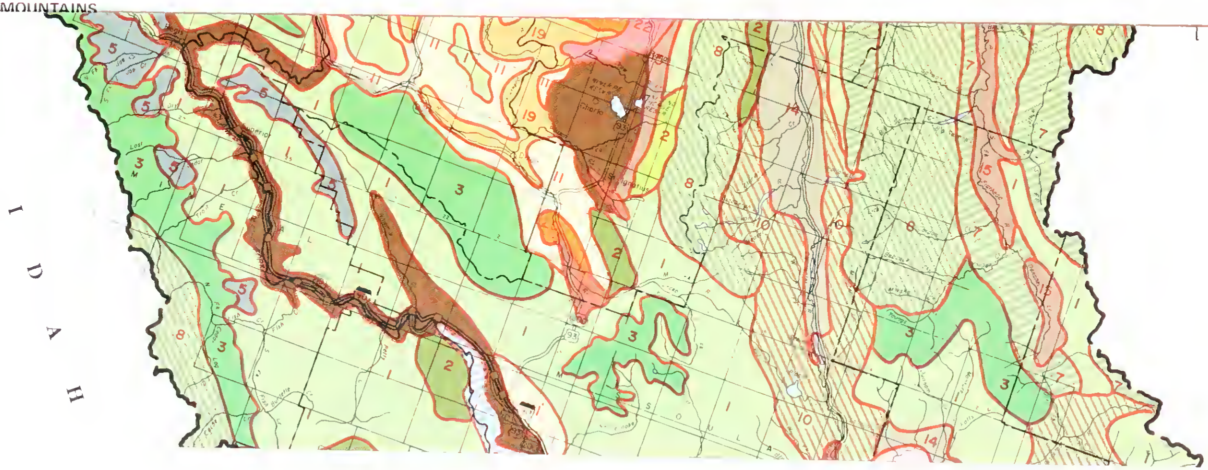
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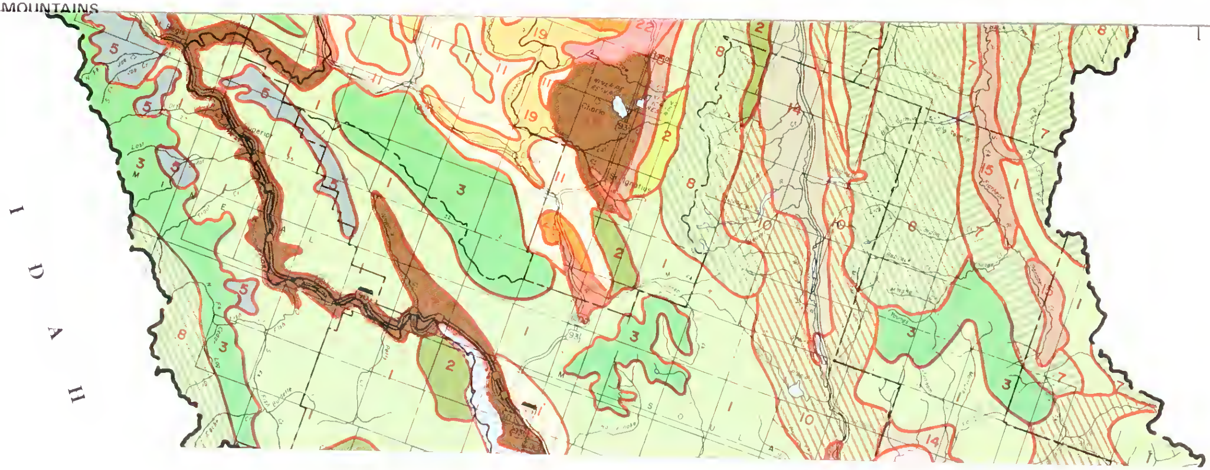
Tertiary sediments - unconsolidated to Generally an adequate aquifer for domestic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SOILS OF THE MOUNTAINS

1	HAPLOBOROLLS-CRYOBOROLLS Moderately sloping to steep, shallow to deep, well-drained soils on rolling hills, benches, and terraces
	CRYOBOROLLS-CALCIBOROLLS-CALCIORTHIDS Sloping to steep, shallow to deep, well-drained, calcareous soils on rolling hills, benches, and terraces
3	USTOCHREPTS-USTORTHENTS Nearly level to steep, deep, well-drained soils on glaciofluvial fans and terraces
4	CRYOCHREPTS-CRYOBORALFS-USTOCHREPTS Gently sloping to steep, deep, well-drained soils on glacial till plains, hills, and terraces.
5	EUTROBORALFS-ARGIBOROLLS Gently sloping to steep, deep, well-drained soils on tertiary benches, terraces, and low mountain foothills.
6	HAPLOBOROLLS-USTOCHREPTS-CRYOCHREPTS Nearly level to sloping, deep, well-drained soils from outwash, on fans and terraces.
7	ARGIBOROLLS-NATRIBOROLLS Nearly level to sloping, deep, well-drained soils on lacustrine fans and benches in uplands
8	CRYOBOROLLS-CRYORTHENTS Moderately sloping to steep, shallow and moderately deep, well-drained soils on mountain foothills
9	NATRARGIDS-EUTROBORALFS-ARGIBOROLLS Nearly level to sloping, deep, well-drained soils on broad lacustrine valleys
10	HAPLOBOROLLS-NATRIBOROLLS-CAMBORTHIDS Nearly level to sloping, deep, well-drained soils on glaciofluvial and lacustrine fans and terraces.

SOILS OF THE HIGH TERRACES AND MOUNTAIN FOOTHILLS

11	HAPLOBOROLLS-USTIPSAMMENTS Nearly level to sloping, deep, well-drained soils on glaciofluvial and eolian fans and terraces.
12	ARGIBOROLLS-CALCIBOROLLS Nearly level to strongly sloping, deep, well-drained, calcareous soils on benches and terraces

13	CRYOCHREPTS-USTOCHREPTS Moderately steep to very steep, shallow to deep, well-drained soils over argillite or quartzite bedrock on the mountains
14	USTOCHREPTS-CRYOCHREPTS Steep and very steep, shallow to deep, well-drained soils over calcareous bedrock on the mountains
	CRYOCHREPTS-CRYANDEPTS Moderately steep to very steep, shallow to deep, well-drained soils over argillite or granite on the mountains.
	CRYOCHREPTS-USTOCHREPTS-USTORTHENTS Moderately steep to very steep, shallow to deep, well-drained soils over granite bedrock on the mountains
	CRYOCHREPTS-USTOCHREPTS-EUTROBORALFS Moderately steep to very steep, shallow to deep, well-drained soils over shaly argillite beds on the mountains
18	CRYOCHREPTS-ROCK OUTCROP Steep and very steep, shallow to deep, well-drained soils over granite, gneiss, and schist, rock outcrops are on tops and sides of glaciated mountains.
19	CRYOCHREPTS, CALCAREOUS, HIGH ELEVATION Steep and very steep, shallow to deep, well-drained soils over calcareous bedrock, extensive areas of rock outcrops are on tops and sides of mountains.
	CRYOCHREPTS-CRYANDEPTS Steep and very steep, shallow to deep, well-drained soils over argillite or quartzite bedrock, extensive areas of rock outcrops are on tops and sides of mountains
21	CRYOCHREPTS, HIGH ELEVATION Steep and very steep, shallow to deep, well-drained soils over cretaceous shales, sandstone and conglomerate, extensive areas of rock outcrops are on tops and sides of mountains
	CRYOCHREPTS-CRYOBORALFS Moderately steep to very steep, deep, well-drained glacial soils on the mountains
23	HAPLOBOROLLS-USTORTHENTS Gently sloping to moderately steep, shallow to deep, well-drained soils over shales or siltstone on rolling hills, benches, and terraces
	CRYOBOROLLS-ARGIBOROLLS Nearly level to strongly sloping, deep, well-drained soils on alluvial benches and terraces in uplands

SOILS OF THE FLOODPLAINS, TERRACES AND ALLUVIAL FANS

25	HAPLOBOROLLS-USTOCHREPTS Nearly level to sloping shallow to deep, well-drained soils on glacial moraines, fans, and terraces
26	HAPLOBOROLLS-ARGIBOROLLS-CRYOBOROLLS Gently sloping to moderately steep, shallow to deep, well-drained soils on low benches and terraces
27	USTIFLUVENTS-HAPLOBOROLLS-USTORTHENTS Nearly level to gently sloping, shallow to deep, well to somewhat poorly-drained soils on flood plains, fans, and low terraces.
28	USTIFLUVENTS-HAPLUDOLLS Nearly level to gently sloping, shallow to deep, well to poorly-drained soils on flood plains, fans, and low terraces.
29	USTIPSAMMENTS-EUTROCHREPTS Nearly level to sloping, deep, well to poorly-drained soils on flood plains, fans, and terraces.

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

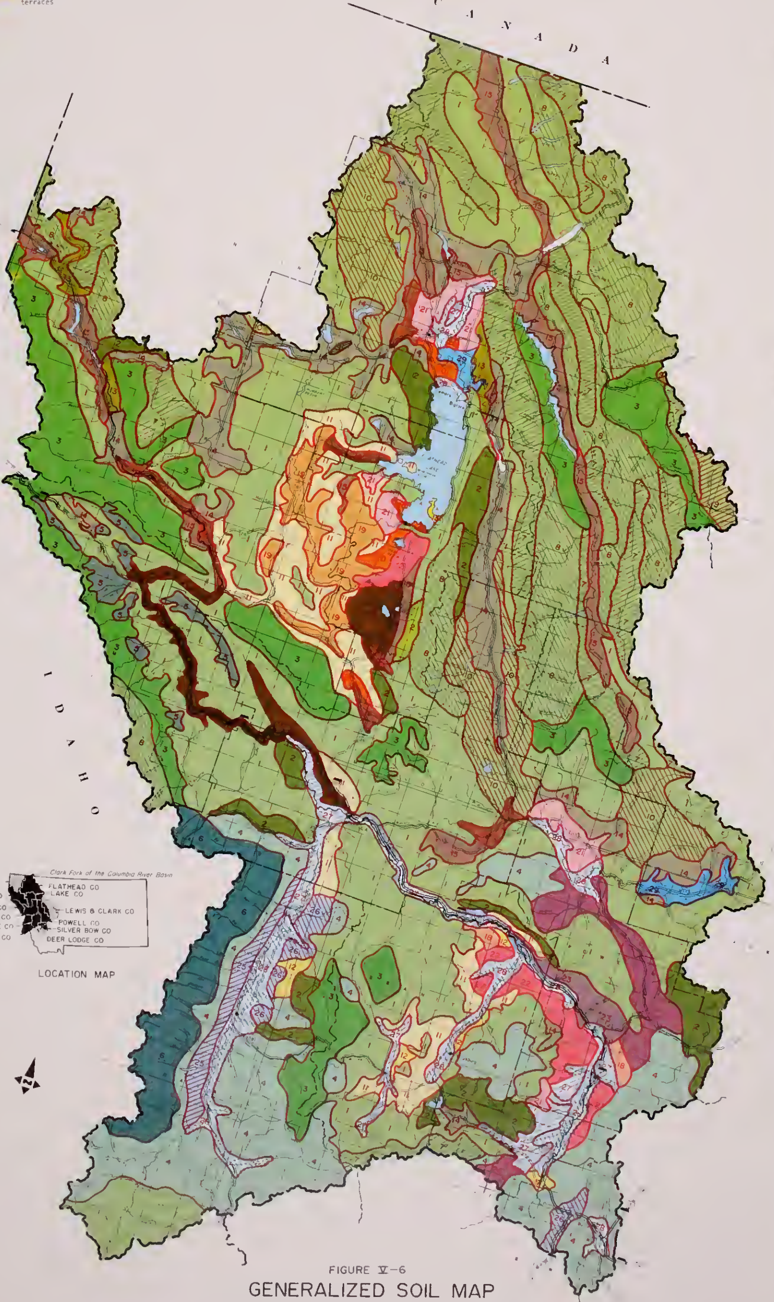


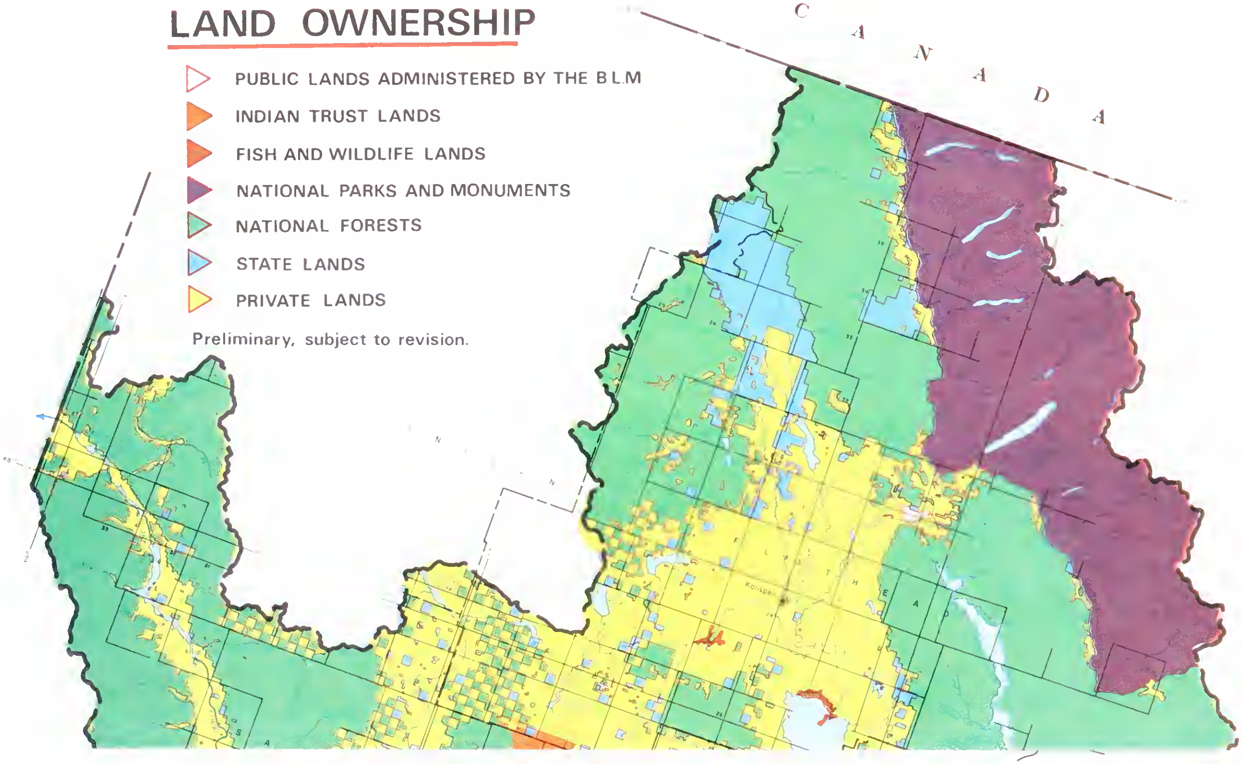
FIGURE V-6
GENERALIZED SOIL MAP
CLARK FORK OF THE COLUMBIA RIVER BASIN
MONTANA

JUNE 1976

PRELIMINARY COPY
SUBJECT TO CHANGE

M7-SN-23425-3

LAND OWNERSHIP



Preliminary, subject to revision.

MONTANA

JUNE 1976

10 0 10 20 MILES

SCALE 1:1 000 000

Compiled by Soil Conservation Service from
Bureau of Land Management maps and data provided
by SCS field technicians, Bureau of Indian
Affairs, and U. S. Forest Service.

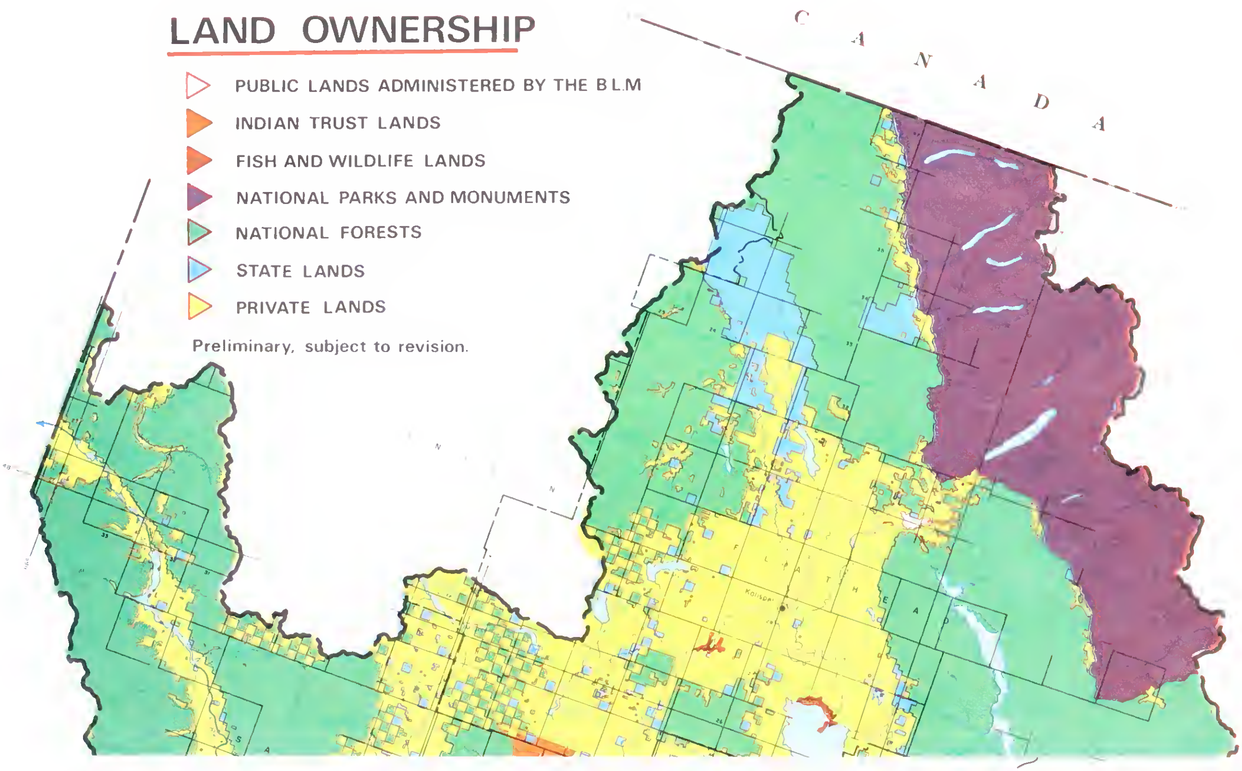
Not a legal map.

SCALE 1:1,000,000

LAND OWNERSHIP

- ▷ PUBLIC LANDS ADMINISTERED BY THE B.L.M.
- ▶ INDIAN TRUST LANDS
- ▶ FISH AND WILDLIFE LANDS
- ▶ NATIONAL PARKS AND MONUMENTS
- ▶ NATIONAL FORESTS
- ▶ STATE LANDS
- ▶ PRIVATE LANDS

Preliminary, subject to revision.



MONTANA

JUNE 1976

10 0 10 20 MILES

SCALE 1:1 000 000

SCALE 1:1,000,000

Compiled by Soil Conservation Service from Bureau of Land Management maps and data provided by SCS field technicians, Bureau of Indian Affairs, and U. S. Forest Service.

Not a legal map.

U.S. DEPARTMENT OF AGRICULTURE USDA-SCS PORTLAND, OR 1976

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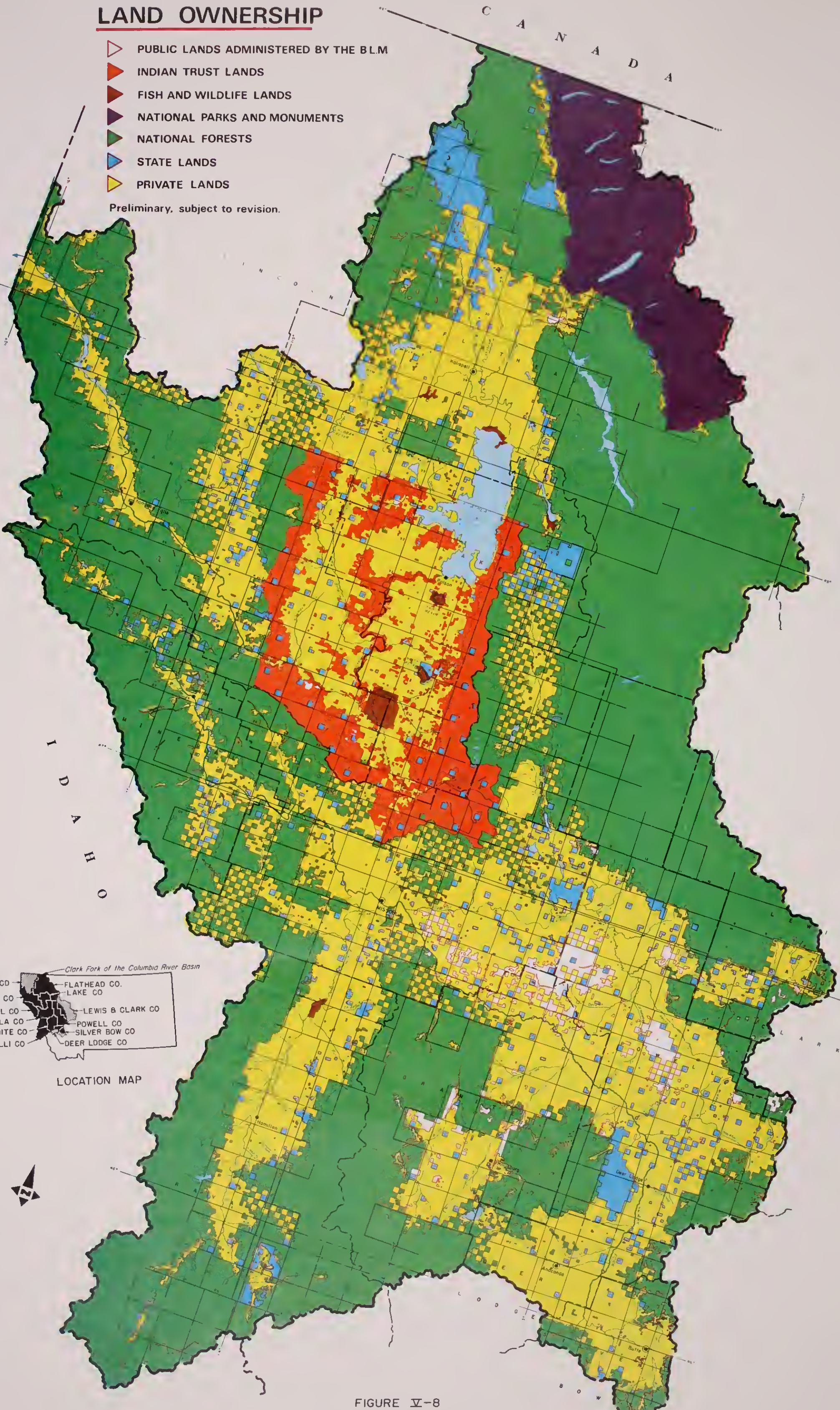

FIGURE Ⅴ-8

LAND OWNERSHIP

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JUNE 1976

10 0 10 20 MILES

SCALE 1:1 000 000

Compiled by Soil Conservation Service from Bureau of Land Management maps and data provided by SCS field technicians, Bureau of Indian Affairs, and U. S. Forest Service.

Not a legal map.

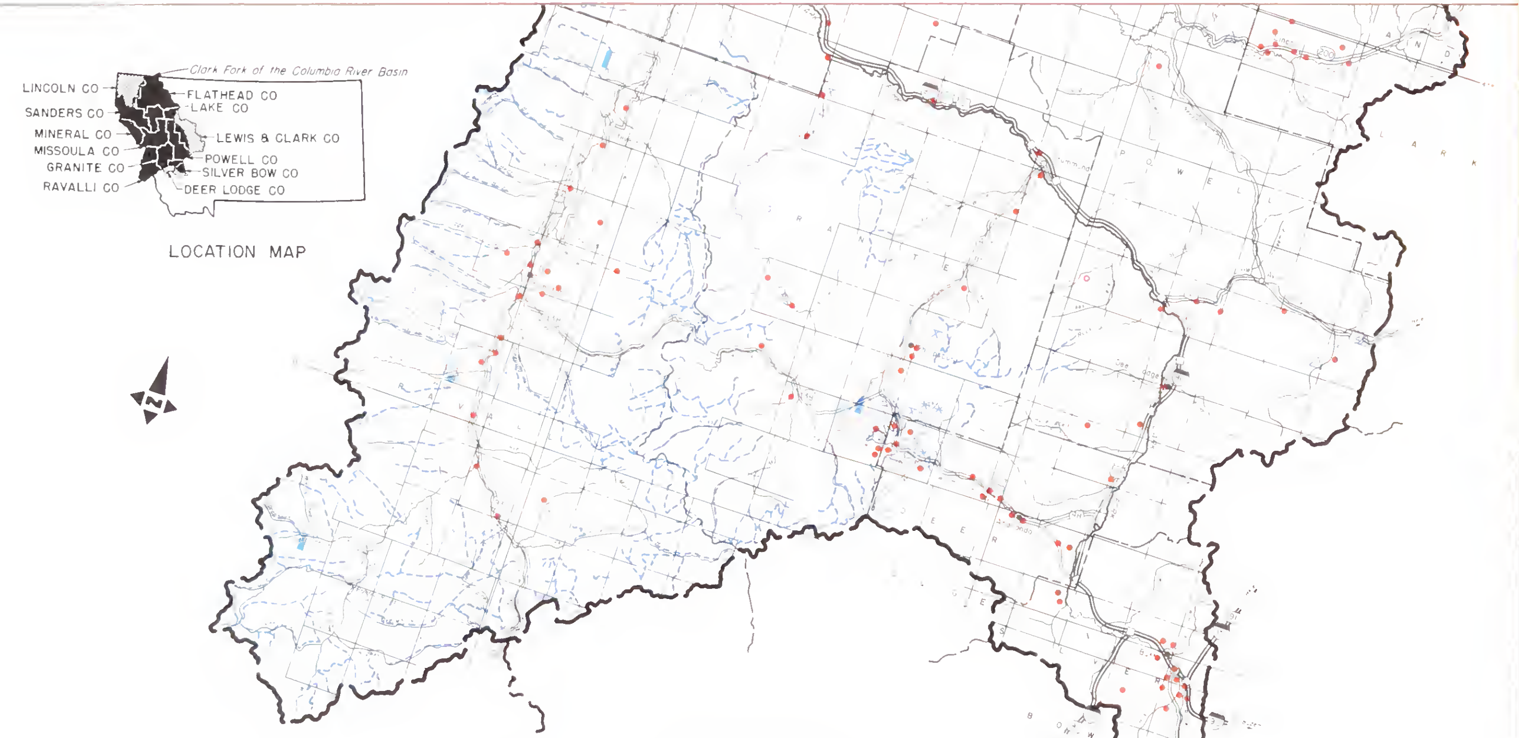

FIGURE V-16

RECREATIONAL FACILITIES

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JUNE 1976

PRELIMINARY COPY
SUBJECT TO CHANGE

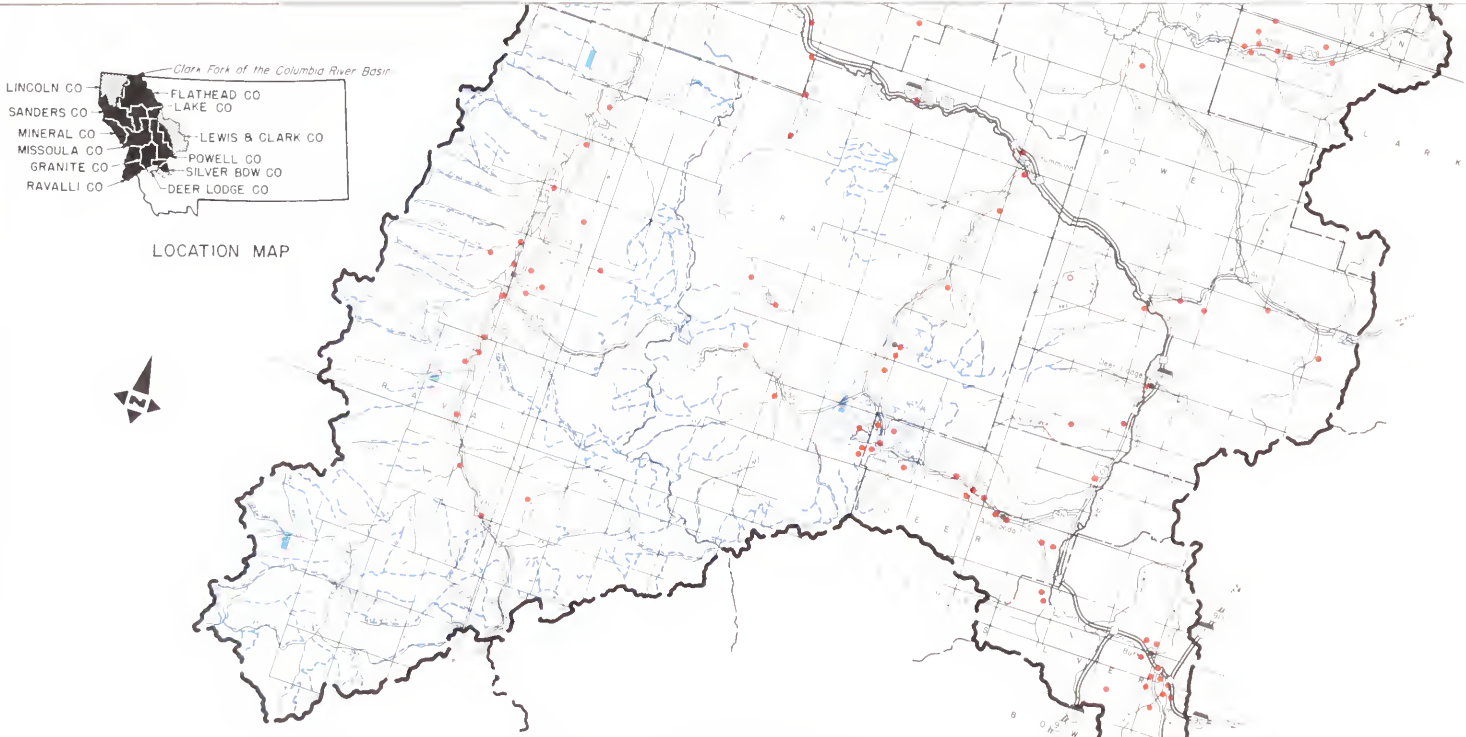

FIGURE V-16

RECREATIONAL FACILITIES

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JUNE 1976

10 0 10 20 MILES

SCALE 1:1,000,000

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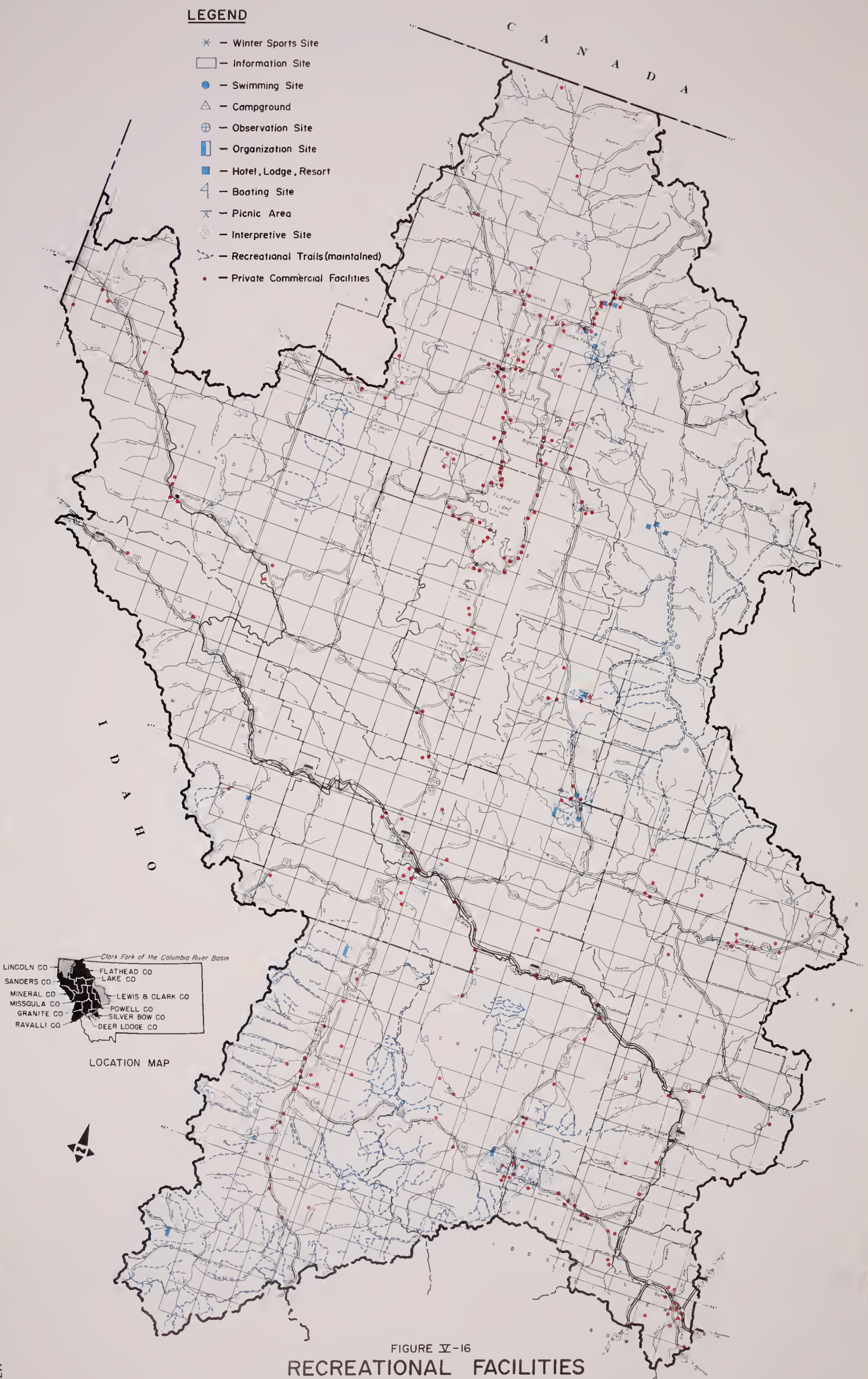

FIGURE V-16

RECREATIONAL FACILITIES

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JUNE 1976

10 0 10 20 MILES

SCALE 1:1,000,000

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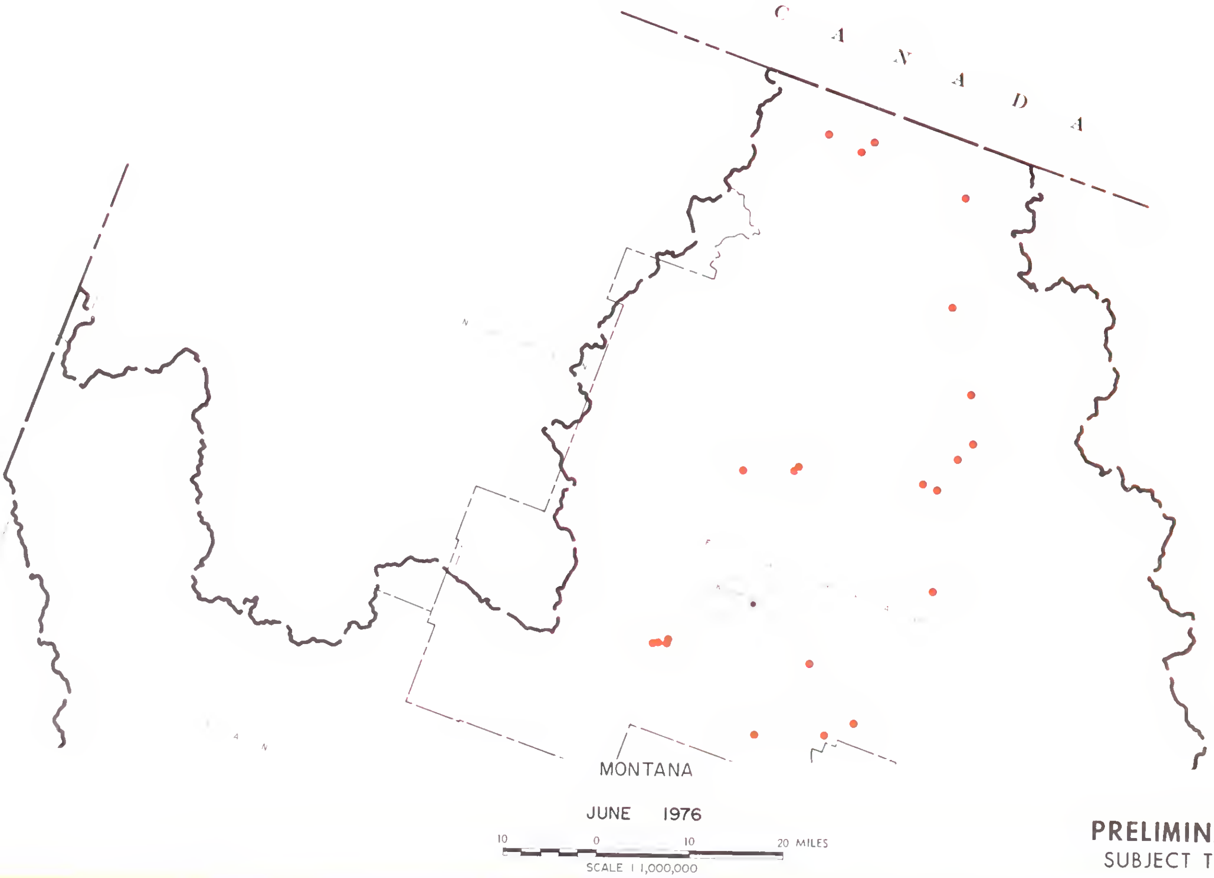

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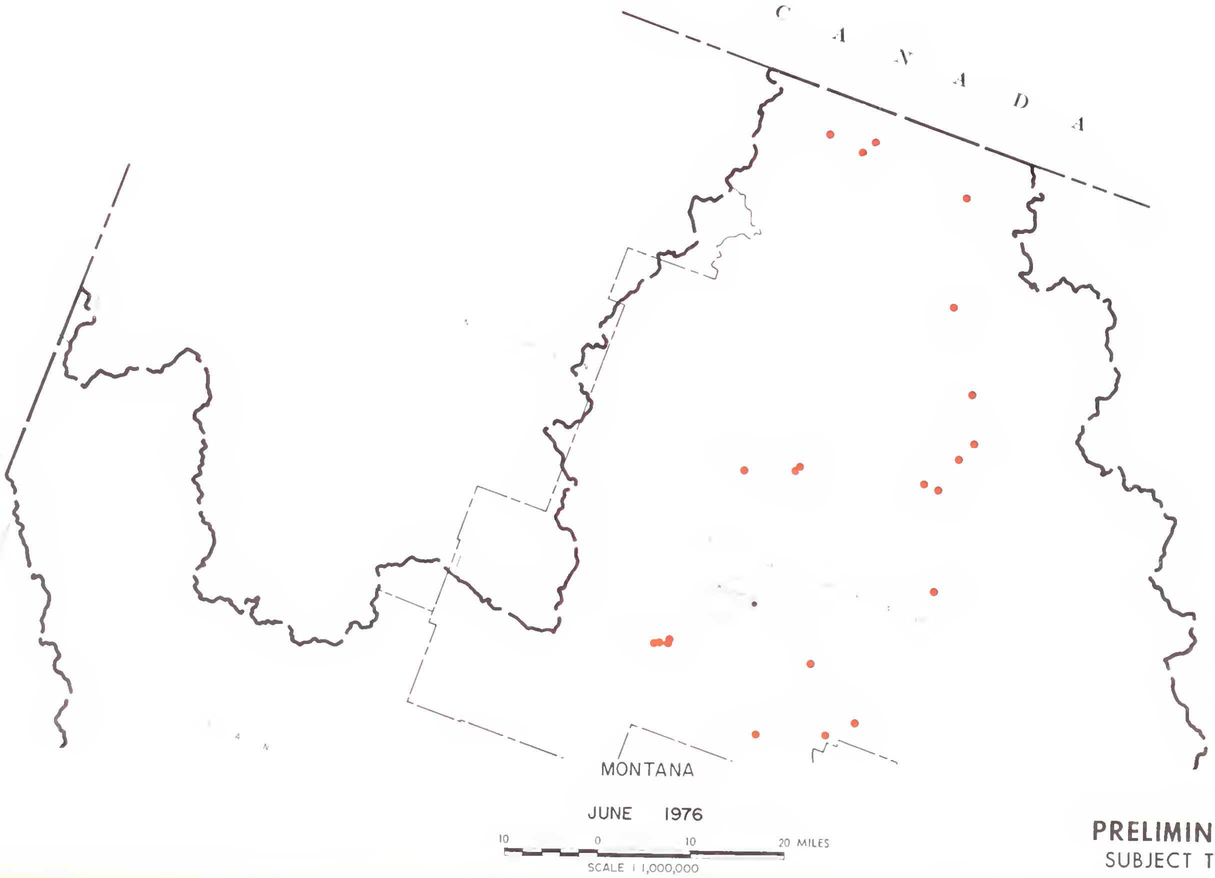
U.S. DEPARTMENT OF AGRICULTURE



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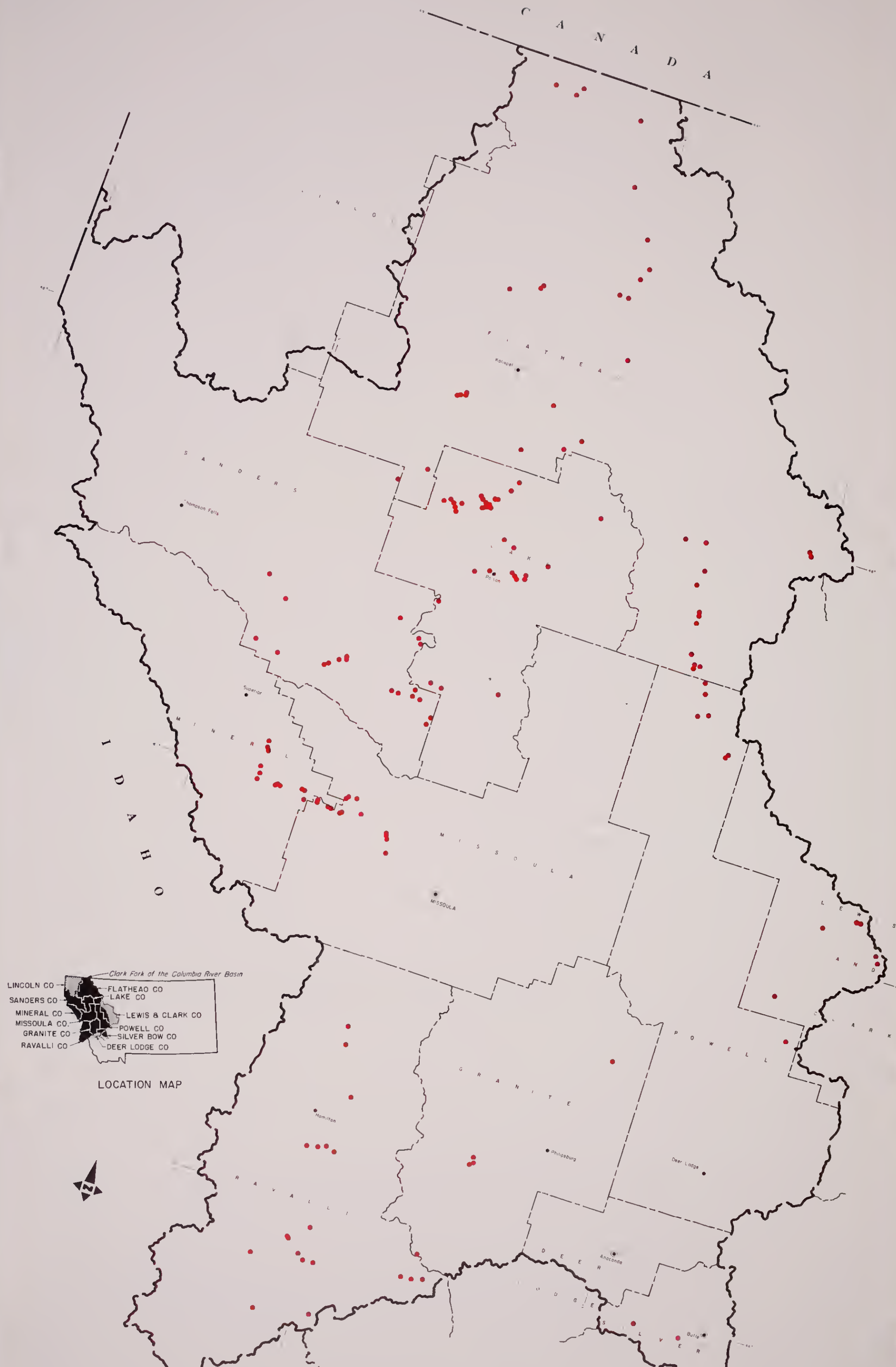

MAP V-18

HISTORICAL AND ARCHEOLOGICAL SITES

CLARK FORK OF THE COLUMBIA RIVER BASIN

MONTANA

JUNE 1976

10 0 10 20 MILES
SCALE 1:1,000,000

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U.S. DEPARTMENT OF AGRICULTURE

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VI--FUTURE CONDITIONS WITHOUT COORDINATED PLANNING

Future conditions, as presented here, are those that are expected to prevail as projected from current trends in population, anticipated changes in technology, and continuation of ongoing programs and projects as restricted by limitations of natural resources and climate. These projected "conditions without coordinated planning" were used as a base from which to measure the remaining desires or unmet needs described in chapter VII. Even without coordinated planning, existing projects and programs, as identified in chapter V, will satisfy part of the NED and EQ component needs identified in chapter III. The effects of implementing the alternative plans in chapter VIII or the preferred plan in chapter IX are to be evaluated by comparison with information in this chapter.

ASSUMPTIONS

-- Population is expected to increase from 204,000 in 1970 to 232,000 in 1990 and to 284,000 in 2020 as based on OBERS series C population projections for this water resource area.

-- Types and acreages of crops are not expected to change significantly. Crop yields will increase most where conventional irrigation changes to sprinkler irrigation, but will increase less on mountain meadow irrigation or dryland.

-- Commercial sawtimber available for boards and dimension lumber will continue to decline. The use of smaller trees for pulp, chipboard, and particleboard products will increase.

-- Some agricultural and forest land will continue to be subdivided and removed from food and fiber production.

-- Based on metal commodity markets, corporate stock market news, and reports of other world mineral discoveries and development, it appears likely that economically useable materials in the Butte area will be depleted long before 2020. As these resources are used up, employment and population in that area will continue to decline.

-- Other than ore depletion at Butte, none of the physical or climatic characteristics of the basin are expected to change materially by 2020.

-- Because of the distances from population and heavy manufacturing centers, climate limitations, and freight rate structures, the principal exports from this basin will continue to be refined metals, lumber, other wood products, beef, seed potatoes, and grains.

-- Only minor changes in private ownership rights in land and use rights in water.

-- New laws will continue to be limiting factors on the rights of landowners and water users.

-- Employment will continue to decline in basic industries and may increase in service industries and government.

-- Air and water pollution control will improve in proportion to the degree of enforcement of existing laws. Such enforcement may be severely limited by lack of funds for personnel, court action, or prohibitive costs for installation of pollution abatement facilities.

-- The population increase will be accompanied by an increased use of land, water, and air.

-- Private irrigation development will continue to take more water from streams and rivers at some detriment to fisheries.

-- Subdivision developments will continue to encroach on forest fringes, streambanks, and lakeshores, thereby reducing fish and wildlife habitat, winter game range, and natural beauty.

Table VI-1 shows estimates of the NED results of continuing existing agency programs.

GENERAL DESCRIPTION OF FUTURE CONDITIONS WITHOUT COORDINATED PLANNING

Land Use Changes by 1990:

Some forest and rangeland will be subdivided and some is being converted to irrigated crops. Some dry cropland will become irrigated cropland and subdivisions. Some irrigated cropland will also be subdivided. "Other" lands will be increased by subdivisions, roads, and utility line construction. Most noticeable will be more houses near streams, lakes, and forest fringes. These residential encroachments will reduce fish and wildlife habitat and reduce the populations of game animals. Some rangeland and marginal forest land may be reserved for winter game range. More wetland will be reserved as waterfowl refuges.

Agricultural Production by 1990:

Cash crops production of grain and seed potatoes will be about the same as at present. Sugar beet production will have disappeared, while hay and irrigated pasture will have increased due to increased irrigation and shifts to sprinkler irrigation. The 1990 crop production is expected to be:

TABLE VI-1--SOME ECONOMIC DEVELOPMENT CONDITIONS EXPECTED BY 1990 IF ONGOING PROGRAMS ARE NOT CHANGED

CLARK FORK OF THE COLUMBIA RIVER BASIN

Component Addressed [1/]	Project or Program	Agencies Involved	Results
NED			
1. Maintain basic industry employment	Industry	Individuals, corporations Chambers of Commerce, cities, states, etc.	Not estimated
2. Reduced flood damages	National Flood Insurance Montana laws, and Corps of Engineers project	Dept. of Housing & Urban Development, State of Montana, counties, cities towns, individuals, and Corps of Engineers	Residential flood hazards will not increase; some areas will be protected, and flood insurance will be available.
3. Improved drainage of Type 1 and II wetland in cropland	Private action with USDA technical and financial assistance; RC&D project measures, or small watershed project	Soil Conservation Service Agricultural Stabilization & Conservation Service, and landowners	__________ acres with adequate drainage systems
4. Full season water supply for presently irrigated land	Small watershed projects, RC&D project measures, and individual action	Landowners with financial and technical assistance from USDA agencies	__________ acres irrigated land with full season supply. __________ acre-feet of water supplied from new storage developments.

TABLE VI-1--SOME ECONOMIC DEVELOPMENT CONDITIONS EXPECTED BY 1990 IF ONGOING PROGRAMS ARE NOT CHANGED

Component Addressed [1]	Project or Program	Agencies Involved	Results
5. Adequate water supplies and systems for all communities	Community action projects	HUD, EPA, State of Montana, and communities with financial assistance from FmHA	____ communities will upgrade their water supplies and ____ communities will improve sewage treatment facilities
6. Improved public outdoor recreation facilities	Outdoor recreation	Forest Service, Bureau of Land Management, and Montana Dept. of Fish and Game	All needed public outdoor recreation facilities will be provided and the quality will be improved.
7. Adequate supply of urban recreation facilities	Community recreation	BOR, HUD, State of Montana, counties, and local communities	Adequate facilities can be made available as local funds are obtained.
8. Education and technical assistance for private recreation	Conservation operations	Private landowners with technical assistance from SCS and other state and federal agencies	Private recreation facilities will be upgraded as technical assistance is sought and provided. The locations, sizes, and types of facilities will depend on local market conditions.

TABLE VI-1--SOME ECONOMIC DEVELOPMENT CONDITIONS EXPECTED BY 1990 IF ONGOING PROGRAMS ARE NOT CHANGED

Component Addressed [1/]	Project or Program	Agencies Involved	Results
9. Additional recreation access to public land and water and fishing access easements on private land	Property acquisition programs	Forest Service and Montana Department of Fish and Game	21 more fishing access sites and 20 more public land access sites by 1990
10. More boat ramps and docks adapted to reservoir fluctuations	Water-borne recreation development	Forest Service, BOR, and Montana Department of Fish and Game	Boating access facilities on 5 more reservoirs
11. Improved efficiency of agricultural & forestry production through improved land treatment (including improved agricultural water management)	Conservation operations	Forest Service and private landowners with USDA technical and financial assistance	Improved land treatment on ________ acres of irrigated cropland; ________ acres of nonirrigated cropland; and ________ acres of range. Forest production increased on 395,000 acres.
12. Protect "other" [2/] land from erosion damage	Conservation operations	Private landowners with USDA technical and financial assistance	________ more acres protected by 1990.
13. Grow more sawtimber-sized trees	Forest management	U. S. Forest Service and private forest landowners	In spite of improved land treatment, the annual allowable cut of sawtimber and veneer logs will decrease by 13.5 million cubic-feet by 1990.

TABLE VI-1--SOME ECONOMIC DEVELOPMENT CONDITIONS EXPECTED BY 1990 IF ONGOING PROGRAMS ARE NOT CHANGED (Cont'd)

Component Addressed [1/]	Project or Program	Agencies Involved	Results
14. Expand use of available wood	Forest management	U. S. Forest Service and private landowners	Use of other than saw-timber wood will increase by 0.7 million cubic-feet annually by 1990.
15. Increase employment through diversification of forest products industry	Wood products industry	Private industry	More complete manufacture of wood products may provide some additional employment by 1990.
16. Routes for new electrical transmission lines	Private industry	Private industry, Forest Service, State of Montana, BLM, Flathead Irrigation Project, Bonneville Power Administration	Local service transmission lines will be completed as needed. Additional long distance lines will also be built as needed. Run of the river generating sites at Buffalo Rapids #2 and #4 may be under design or construction by 1990.

Crop	Units	1990	Current Normal
Wheat	bushels	2,400,000	1,966,000
Oats	bushels	580,000	488,000
Barley	bushels	2,700,000	2,249,000
Potatoes	cwt	1,105,000	1,012,000
Corn silage	tons	19,000	18,000
Hay	tons	930,000	673,000

This production is based on the assumptions that average yields by 1990 will be equal to current yields from the upper 10 percent level of management. That management includes improved land treatment, more fertilizer use, better varieties, and better water management.

Forestry Production by 1990:

The total annual volume of wood harvested from commercial forests, with ongoing levels of management, is expected to decline from the 1970 harvest of 121.8 million cubic-feet to 109.0 million cubic-feet by 1990. This harvest is dominated by saw and veneer log production which is expected to decline from 719 million board-feet in 1970 to 637.5 million board-feet in 1990. Employment associated with saw and veneer log production will decline from 5,300 in 1970 to 4,600 in 1990. This decline will be due to both the drop in production and to improvements in labor productivity.

Investments in new techniques that make better use of wood from small, dead, or crooked trees and from presently noncommercial species will only partly offset the effects of the reduction of saw and veneer log production. The production of this wood is expected to increase only from 2.7 million cubic-feet in 1970 to 3.4 million cubic-feet in 1990. Employment associated with this production and with forest management is expected to increase from 1,300 in 1970 to 1,700 in 1990 and will require new skills in the labor force. The net change in forest sector employment will be a drop from 6,600 in 1970 to 6,300 in 1990.

Water Use by 1990:

Measurable changes in consumptive use of water will be dominated by increases in private irrigation. About more acre-feet will be used in late summer on acres now irrigated and more acre-feet will be used on acres newly irrigated land. Although municipal and industrial use of water will increase in proportion to increases in population and manufacturing, the increased consumptive use will be insignificant when compared with total water available in the basin.

Other Changes by 1990:

Recreational use is expected to increase in proportion to increases in national and regional population with some dampening effect from gasoline shortages and increasing prices. Recreation activity occasions are projected to increase from 14,868,000 in 1970 to 21,870,000 in 1990.

SPECIFIC DESCRIPTION OF FUTURE CONDITIONS WITHOUT COORDINATED PLANNING

The following items refer to changes in specific components identified in chapter III.

National Economic Development

Examples of projected accomplishments by 1990 as related to specific NED objective components include:

(1) Basic employment will decrease in forest products even with more intensive manufacture of wood products. Mineral employment and agricultural employment will continue to decline. Employment in light industry is expected to increase. Employment in recreation and tourism is expected to increase though probably at a slower rate than in the past. There will be some continued subdivision of agricultural and commercial forest land, but existing laws requiring that subdividers provide detailed planning and show need for each subdivision has slowed this activity.

(2) Flooding will have only a minor effect on agricultural production and generally is not a hazard to life. The Corps of Engineers Flathead Project will reduce damages to residential units near Kalispell by 1990. Ongoing programs described in chapter V will adequately solve flood damage problems or make flood insurance available.

(3) Cropland drainage under existing programs will increase production on only acres by 1990 as based on current rates of agricultural drainage.

(4) In addition to the expected private irrigation development, late-season irrigation water supplies will be improved by acre-feet for acres by USDA-assisted projects and by . acre-feet for acres by the Bureau of Indian Affairs Flathead Irrigation Project.

(5) Municipal water systems will be improved for small towns under FmHA programs and cities under HUD programs.

(6) Public outdoor recreational facilities will be adequately adjusted in number, type, and location under existing programs of the National Park Service, Forest Service, and other agencies.

(7) Urban recreational facilities will be provided as local matching funds become available. Present programs of BOR and Montana Department of Fish and Game are adequate to meet the needs by 1990.

(8) Private recreational facilities will adjust in type and numbers by 1990 through the process of economic attrition.

(9) Fishing access points will increase by 21 sites by 1990 under Montana Department of Fish and Game programs. Access points to public lands will increase by 20 sites under acquisition programs of the Forest Service.

(10) Boating access facilities will be developed on 5 reservoirs under BOR programs administered by Montana Department of Fish and Game.

(11) Land treatment will be improved and production will be increased under ongoing programs on acres of irrigated land; acres of dryland; and acres of range. Forestry production will be increased on 395,000 acres of commercial forest under ongoing forestry programs. That portion of increases in production of food and fiber that will result from land treatment under ongoing programs include:

for irrigated land:	Wheat	________	bu.
	Barley	________	bu.
	Pasture	________	AUM's
	Hay	________	tons
for dryland and range:	Wheat	________	bu.
	Hay	________	tons
	Pasture	________	AUM's
	Range	________	AUM's
for wood production:	Saw and veneer logs	32.9 million cu. ft.	
	Lower quality wood	11.9 million cu. ft.	

(12) Treatment of "other" land under ongoing programs will protect acres by 1990.

(13) In spite of the increase from treatment on 395,000 acres, the allowable cut of timber for sawlogs and veneer logs will decrease by 13.5 million cubic-feet by 1990.

(14) Use of other wood will increase by 0.7 million cubic feet by 1990 through use of new technology and assistance from Forest Service.

(15) More complete manufacture of wood products may provide some additional employment by 1990. Most of this increase will come from private enterprise initiative and will depend greatly on the relative freight rates and other costs of manufactured goods versus those for raw lumber.

(16) By 1990, additional large-capacity transmission lines will have been constructed to carry large quantities of electricity into and through the basin. These will have been built under programs of Bonneville Power Administration and private public utility companies. Also, by 1990, the hydroelectric dams of Buffalo Rapids #2 and #4 may be under construction.

Environmental Quality

Examples of projected accomplishments by 1990 as related to EQ specific objective components include:

(1), (2) SCS will provide assistance for erosion control on acres of cropland; acres of rangeland; acres of other lands; and miles of streambank protection.

U. S. Forest Service will provide erosion and sediment control on acres of forest land and miles of streambank, roads, and other areas.

(3) Communities under FmHA loan programs will develop secondary sewage treatment facilities. Industrial wastes will be controlled by companies.

(4) SCS will provide assistance for acres of irrigation water management to improve water quality.

(5) Air pollution from all major sites will be controlled.

(6) Reservoir management for scenic beauty purposes is not anticipated.

(7) Protection of 20,000 acres of vegetation will be provided by designation of wild and scenic areas. The Montana lakeshore protection law and the streambed preservation act as well as ongoing forest management programs will provide some additional protection.

(8) The U. S. Forest Service will provide 20 additional access points to public land.

(9) Zoning and land management for preservation of open and green space will continue at a slow rate.

(10) Protection of free-flowing streams will probably not exceed the 219 miles of rivers which will be designated as scenic or wild rivers.

(11) Road and utility line placement and construction will be adequately planned and controlled.

(12) Small watershed projects will provide minimum streamflow in 32 miles of stream.

(13) Modification of Hungry Horse dam and operation to provide stabilization of extreme flow and temperature fluctuations will probably not occur.

(14) The Montana Department of Fish and Game will provide an additional 50,000 acres of big game winter range. Private landowners and the Montana

Department of Fish and Game will provide an additional 2,800 acres of upland game habitat. The U. S. Fish and Wildlife Service and the Montana Department of Fish and Game will preserve acres of wetland habitat.

(15) Most structures which block fish will probably remain.

(16) Due to a lack of funds, few archeological, historical, or cultural sites will be protected.

Other Conditions

More than 1.8 million acres (about 27 percent of the land in National Forests in the Clark Fork) are either classified or included in new study areas for possible additions to the National Wilderness Preservation System. The 1.8 million acres include 11 inventoried roadless areas selected as study areas for further consideration as possible additions to the National Wilderness Preservation System. The 11 areas contain about 650,000 acres, including 273,000 acres of commercial forest land. This has reduced the region's allowable cuty by approximately 18 million board-feet or 2.5 percent of the 1970 harvest.

Another 77 inventoried roadless areas in the Clark Fork contain 1.6 million acres. Of this, 1.1 million acres are classified as commercial forest land with an annual allowable cut of about 100 million board-feet. While this timber is now part of the allowable regional cut calculations, timber harvesting or road building will be delayed in these areas until land-use planning is completed and environmental statements have been filed. Should the land-use planning decisions indicate that any of the areas will be classified in a manner that prevents or modifies the harvesting of timber, the allowable cut will be adjusted accordingly.

Approximately 219 miles of rivers will be classified as scenic, wild, or recreation rivers. This designation would preclude the building of dams and could affect the potential hydroelectric generating capacity of the basin.

CHAPTER VI--SUMMARY TABLE--FUTURE CONDITIONS WITHOUT COORDINATED PLANNING

ASSUMED CONDITIONS					RELATED PRODUCTION OR EMPLOYMENT				
Resources Related to NED Objectives:									
Item	Unit	1975	1990	2020	Item	Unit	1975	1990	2020
1. Basic Employment:					Basic Employment:				
Mineral-based employment (mining and smelting)	Man-Yrs	--	--	--	Mineral Employment	Man-Yrs	--	--	--
					Agric. Employment	"	--	--	--
Primary Cropland	Ac.	--	--	--	Forestry Employment	"	--	--	--
Commercial Forest	Ac.	--	--	--					
2. Flood Damages:					Increased Production:				
Agricultural land	Ac.	--	--	--	Crop & pasture output	XX	Only minor change.		
Residential land	Ac.	--	--	--	Residential housing	XX	____ flood-free units on flood plains by 199		
3. Cropland Drainage:	Ac.	--	--	--	Increased Production:				
					Hay	T.	XX	--	--
					Grain	Bu.	XX	--	--
					Pasture	AUM's	XX	--	--
4. Irrigation (late season water):					Irrig. Production:				
					Hay	Tons	--	--	--
Irrigated land	Ac.	--	--	--	Wheat	Bu.	--	--	--
Irrig. water used	Ac-Ft	--	--	--	Barley	Bu.	--	--	--
					Pasture	AUM's	--	--	--

CHAF 'I--SUMMARY TABLE--FUTURE CONDITIONS WITHOUT C NATED PLANNING (Continued)

	ASSUMED CONDITIONS					RELATED PRODUCTION OR EMPLOYMENT				
	Resources Related to NED Objectives:									
	Item	Unit	1975	1990	2020	Item	Unit	1975	1990	2020
5.	Municipal Water Supply:					Needing Assistance:				
	Small communities	Nos	--	--	--	Small communities	Nos	--	--	--
	Cities	Nos	--	--	--	Cities	Nos	--	--	--
	Recreational Items:					Recreation Opportunities:				
6.	Rural Rec. facilities	Nos	Adeq	Adeq	Adeq	Rural Outdoor	Nos	Adeq	Adeq	Adeq
7.	Urban Rec. facilities	Nos	Inadeq	--	--	Urban Outdoor	Nos	--	--	--
	Quality Improvement:	Needed Nos				Dispersed Use:	New Sites			
8.	Private recreation	Nos	Excess	Adeq	Adeq	Priv. Facilities	Nos	Excess	Adeq	Adeq
9.	Fishing access points	"	--	--	--	Stream fishing	"	XX	--	--
	Public land access pts	"	--	--	--	Forest-based rec.	"	XX	--	--
10.	Reservoir boat ramps	"	--	--	--	Reservoir boating				
11.	Land Treatment:					Irrig. Production:				
	Irrigated land	Ac	--	--	--	Wheat	Bu	--	--	--
	Adeq. land treatment	Ac	--	--	--	Hay	Tons	--	--	--
						Pasture	AUM's	--	--	--
	Dryland & Range:					Non-Irrig. Production:				
	Crop & pasture	Ac	--	--	--	Wheat	Bu	--	--	--
	Adeq. land treatment	"	--	--	--	Hay	Tons	--	--	--
	Range & grazable forest	"	--	--	--	Pasture	AUM's	--	--	--
	Adeq. land treatment	"	--	--	--	Range Forage	AUM's	--	--	--
	Forestry:					Wood Production:				
						Saw and veneer logs	Cu-Ft.	--	--	--
	Commercial Forest	Ac	--	--	--	Chips	"	--	--	--
	Adeq. land treatment	Ac	--	--	--	Pulp	"	--	--	--

CHAPTER VI--SUMMARY TABLE--FUTURE CONDITIONS WITHOUT COORDINATED PLANNING (Continued)

	ASSUMED CONDITIONS					RELATED PRODUCTION OR EMPLOYMENT				
	Resources Related to NED Objectives:									
	Item	Unit	1975	1990	2020	Item	Unit	1975	1990	2020
12.	Other Land Treatment:	Ac	--	--	--	Employment	Minimal change			
13.	Increased saw timber production	Ac	--	--	--	Allowable cut	Cu.-Ft.	--	--	--
14.	Increased use of other wood	Ac	--	--	--	Allowable cut	"	--	--	--
15.	More complete manufacture of wood products	No. of plants	--	--	--	Increased employment	Man-days	--	--	--
16.	Increased hydroelectric generation	No. of sites	--	--	--	Increased power supply	MGW	--	--	--
	Increased power transmission lines	Mi	--	--	--					

CHAPTER VI--SUMMARY TABLE--FUTURE CONDITIONS WITHOUT COORDINATED PLANNING

Assumed Conditions

Related to EQ Objectives

Item		Unit	1975					1990					2020				
			Crop	Range	Forest	Other	Stream road	Crop	Range	Forest	Other	Stream Road	Crop	Range	Forest	Other	Stream Road
1. & 2.	Erosion & Sedimentation																
	Erosive land	acres	173,000	1,000,000	62,000	84,000											
		miles					2,552										
	Expected Treatment	acres															
		miles															
	Problem without plan	acres															
		miles															
3.	Effluent treatment facilities																
	Sewage treatment problems	ea.			41												
	Expected complete treatment	ea.			0												
	without plan	ea.			41												
	Industrial waste problem	ea.			9												
	Expected treatment facilities	ea.															
	without plan	ea.															
4.	Irrigation water pollution																
	Expected management	acres															
	Problem without plan	acres															
5.	Air pollution																
	Problem sites	each			6												
	Expected management	each															
	Problem without plan	each.															

CHAPTER VI--SUMMARY TABLE --FUTURE CONDITIONS WITHOUT COORDINATED PLANNING

Assumed Conditions

Asau

Related to EQ Objectives

Item	Unit	1975	1990	2020
6. Reduced reservoirs water fluctuations				
Problem sites	each	4	4	4
Expected management	each	0	0	0
Problem sites without plan	each	4	4	4
7. Riparian vegetation				
Needing protection	miles	565	565	565
Expected protected and managed	miles	0	0	0
Protection needed without plan	miles	565	565	565
8. Access facilities				
Facilities desired	each	39	39	39
Expected new facilities	each	0		
Without plan needed facilities	each	39		
9. Open & Green Space				
Protected & managed	acres	all present	all present	all present
Expected	acres	0	0	0
Without plan needed	acres	all present	all present	all present

CHAPTER VI--SUMMARY TABLE--FUTURE CONDITIONS WITHOUT COORDINATED PLANNING

Assumed Conditions

Related to EQ Objectives

Item		Unit	1975	1990	2020
10.	Free flowing streams				
	Desired	miles	all presently	all presently	all presently
	Expected	miles	same	same	same
	Without plan	miles	all presently	all presently	all presently
11.	Roads & utilities				
	Planned	each			
	Expected planned	each			
	Without plan	each			
12.	Minimum streamflows				
	Adequate flow	miles			
	Expected planned	miles			
	Without plan	miles			
13.	Water & temperature fluctuations				
	Control of Hungry Horse	each	1	1	1
	Expected control	each	0	0	0
	Needed without plan	each	1	1	1

Item		Big Game			Upland			Wetland		
		1975	1990	2020	1975	1990	2020	1975	1990	2020
14.	Wildlife habitat									
	Desired habitat	1,420,000	1,420,000	1,420,000	2,800	2,800	2,800			
	Expected habitat control	69,000	119,000	190,000	600	800	1,400			
	Needed without plan	1,351,000	1,301,000	1,230,000	2,200	2,000	1,400			

CHAPTER VI--SUMMARY TABLE --FUTURE CONDITIONS WITHOUT COORDINATED PLANNING

Assumed Conditions

Related to EQ Objectives

Item	Unit	1975	1990	2020
15. Fish migration				
Problem with fish passage	each	1	1	1
Expected passage	each	0	0	0
Needed without plan	each	1	1	1

VII--REMAINING NEEDS

If goods for NED production and EQ preservation and enhancement for future timeframes are to be realized, then certain programs need to be accelerated or initiated and certain projects need to be installed. Remaining needs as defined in this chapter are those parts of the components of objectives identified in chapter III and quantified in chapter IV that will not be met by existing programs applied at current rates described in chapter VI. The component needs include items for future production of the basin's share of food and fiber, enhancement of environmental conditions, improvement of economic opportunity, and improvement of security from natural hazards.

The remaining needs include the following specific component items that were quantified in chapter IV, minus parts of the items that will be met by ongoing programs by 1990 as identified in chapter VI.

National Economic Development Needs

(1) In order to maintain a viable economy for the anticipated population, there is a need to preserve as much basic employment as possible in the renewable extractive industries of forestry and agriculture and to attract more basic manufacturing employment. In order to offset declining employment in mineral products, forest products, and agricultural industries, the basin needs to generate __________ man-years of work in basic manufacturing by 1990 and additional _______ man-years in basic employment by 2020. There will still be a need to identify and protect the better agricultural and forest land from subdivision.

(2) Flood damages to agricultural lands will continue, but the economic benefit from preventing these losses is insufficient to justify structural measures. Flood damages to residences near Kalispell will have been reduced by flood dike system and impacts of damages to residences elsewhere in the basin will have been reduced by flood plain insurance and flood plain zoning. Thus, flood damage reduction is eliminated as a remaining need for economic reasons and will be treated as an incidental benefit where multipurpose structures reduce flood flows.

(3) About ____________ acres of cropland now classed as Type I and II wetland will still need drainage for improved efficiency of agricultural production by 1990.

(4) In order to maximize efficiency and production on ____________ acres of presently irrigated land that will still be short of late-season water in 1990, there is a need to store ______________ acre-feet of water in those watersheds having that problem.

(5) There will still be a need to improve municipal water systems for _____ communities.

(6) Rural recreation facilities will have been adequately provided by 1990 and additional facilities will not be needed at that time. Additional units may be needed by 2020, but would be provided by ongoing federal, state, and local programs and private enterprise.

(7) Urban recreational facilities will have been adequately provided under ongoing programs and will be no longer considered as a need.

(8) Private recreational facilities will have completed their economic adjustment by 1990 and will be adequate to meet the demand.

(9) Fishing access points will still be needed at 40 sites that will not be provided under current programs by 1990. Access to public land will still be needed at 19 sites.

(10) Boating access facilities will still be needed on 6 reservoirs.

(11) Additional land treatment to improve production and efficiency of resource use will still be needed on __________ acres of irrigated land; __________ acres of dryland; __________ acres of range; and 3,805,000 acres of commercial forest.

Many of the commodities needed to meet the OBERS projections of the basin's share of national production cannot be met through current rates of land treatment. Remaining commodity needs are shown in the following table for both OBERS and state levels of projections. Chapter VIII will discuss the methods of meeting these remaining needs.

REMAINING COMMODITY NEEDS

Commodity	Unit	OBERS Projected Needs	To Be Met From Current Rate of Programs	Remaining Commodity Needs
1990:				
Wheat	Bu.			
Barley	Bu.			
Hay	Tons			
Pasture	AUM's			
Range forage	AUM's			
Wood production	Cu.-Ft.	151,000,000	109,000,000	42,000,000
2020:				
Wheat	Bu.			
Barley	Bu.			
Hay	Tons			
Pasture	AUM's			
Range forage	AUM's			
Wood production	Cu.-Ft.	195,000,000	100,000,000	95,000,000

REMAINING COMMODITY NEEDS

Commodity	Unit	Modified Projected Needs	To Be Met From Current Rate of Programs	Remaining Commodity Needs
1990:				
Wheat	Bu.			
Barley	Bu.			
Hay	Tons			
Pasture	AUM's			
Range forage	AUM's			
2020:				
Wheat	Bu.			
Barley	Bu.			
Hay	Tons			
Pasture	AUM's			
Range forage	AUM's			

(12) "Other" land treatment will still be needed on ____________ acres by 1990.

(13) In order to meet OBERS projected needs for sawlogs and veneer logs for 1990, there will need to be an increase of 37 million cubic-feet more than will be met at current rates under ongoing programs.

(14) Use of other wood will need to increase by 5 million cubic-feet by 1990.

(15) Additional manufacturing of forest products is needed to increase employment by 1990.

(16) The basin will continue to be adequately supplied with electricity and utility lines from local generation and imports through 1990. Planning for additional local generation will be needed to meet projected loads beyond 1990.

Environmental Quality Needs

(1) (2) There will still be a need for control of erosion and sedimentation on ____________ acres of cropland; ___________ acres of rangeland; ____________ acres of forest land: ___________ acres of other lands; and __________ miles of streambanks, roads, and like areas by 1990. By 2020 control will be needed on ______________ acres of cropland; _______________ acres of rangeland: _______________ acres of forestland; _______________ acres of other lands; and ___________ miles of streambanks, roads, and like areas.

(3) Complete sewage treatment facilities will still be needed for 21 communities by 1990 but will be completed by 2020. Industrial waste treatment facilities will be constructed by 1990.

(4) To control water pollution due to irrigation runoff, __________ acres of irrigation water management will be needed by 1990 and an additional ____________ acres by 2020.

(5) Control of air pollution will be realized by 1990.

(6) Reduced water fluctuations on 11 reservoirs for purposes of improving scenic beauty will be needed by 1990. These same sites will need control by 2020.

(7) About 79,000 acres of riparian vegetation along rivers and lakes will require protection by 1990. An additional ____________ acres will need protection by 2020.

(8) Additional access to public lands will still be needed at 19 sites that cannot be provided by ongoing program rates by 1990. Adequate access can be achieved by 2020.

(9) There will still be a need to protect open and green space by 1990. This need will continue into 2020.

(10) There will still be a need to protect free-flowing streams through 1990.

(11) Strictly enforced, existing laws are adequate to control the placement and construction of roads and utility lines in the future.

(12) Adequate minimum streamflows will be needed by 1990 on ________ miles of streams. These same streams will need to be protected through 2020.

(13) Water temperature and fluctuation control below Hungry Horse Dam will still be needed by 1990, but it is anticipated that these problems will be corrected by 2020.

(14) Because it is expected that the cost share monies for purchase or lease of wildlife habitat will be maintained at their present level, 1,301,000 acres of big game range; 9,700 acres of upland habitat; and ________ acres of wetland habitat will still be needed by 1990. Approximately 1,230,000 acres of big game range; 5,900 acres of upland habitat; and __________ acres of wetland habitat will be needed by 2020.

(15) Fish passage around existing blockage structures will still be needed in 1990. This problem could be corrected by 2020.

(16) Protection will still be needed for archeological, historical, and cultural sites through 1990 and 2020.

CHAPTER VII--SUMMARY TABLE--NEEDS [1/]

	NED Component Needs			
	Unit	1975	1990	2020
1. Basic Employment: (needed to offset loss)				
Mineral-based employment	Man-Yrs	xx		
Agricultural employment	"	xx		
Forestry employment	"	xx		
2. Flood Damage Reduction:				
Agricultural land	Ac			
Residential land	Ac			
3. Cropland Drainage:	Ac			
4. Irrigation (late season water):				
Irrigated land	Ac			
Irrig. water needed	Ac-Ft			
5. Municipal Water:				
Small communities	Nos			
Cities	Nos			
6. Rural Rec. Facilities:				
Camp sites	Nos			
Picnic areas	"			
Picnic tables	"			
Boat ramps	"			
7. Urban Rec. Facilities:				
Golf courses	"	--	--	
Baseball fields	"			--
Outdoor basketball courts	"			--
Tennis courts	"			--
Swimming areas	"			--
Wading pools	"			--
Meeting rooms	"			--
Playgrounds	"			--
Gymnasiums	"			--
Craft rooms	"			--
Handball courts	"			--

CHAPTER VII--SUMMARY TABLE--NEEDS [1/] (Continued)

		NED Component Needs			
		Unit	1975	1990	2020
8.	Private Recreation	Nos	Excess	Adeq	Adeq
9.	Public Access for Rec.				
	Fishing access points	Nos			
	Public land access points	Nos			
10.	Reservoir Boat Ramps	Nos			
11.	Land Treatment to Improve Production				
	Irrigated land	Ac			
	Dry land	Ac			
	Range	Ac			
	Commercial forest	Ac			
12.	Land Treatment to Protect "Other" Lands	Ac			
13.	Increased Saw Timber	Cu-Ft			
14.	Increased Use of Other Wood	Cu-Ft			
15.	More Complete Mfg. of Wood Products	Man-days			
16.	Increased Power Supply	MGW			

CHAPTER VII--SUMMARY TABLE--NEEDS (Continued)

	NED Component Needs			
	Unit	1975	1990	2020
Commodities Needed to Meet OBERS Projections				
Irr. Crop Production: (needed to meet OBERS)				
Hay	Tons			
Wheat	Bu			
Barley	Bu			
Pasture	AUM's			
Nonirrig. Production:				
Wheat	Bu			
Hay Pa	Tons			
Pasture	AUM's			
Range forage	AUM's			
Wood Production:				
Saw & veneer logs	Cu-Ft			
Chips	Cu-Ft			
Pulp	Cu-Ft			
Irrigation: (needed to meet OBERS)				
Irrigated land	Acres			
Irrigation water used	Acre-Ft			
Commodities Needed to Meet State Projections				
Irrig. Crop Production:				
Hay	Tons			
Wheat	Bu			
Barley	Bu			
Pasture	AUM's			
Irrigation: (needed for State projections)				
Irrigated land	Acres			
Irrigation water used	Acre-Ft			

CHAPTER VII--SUMMARY TABLE--NEEDS

Item		Remaining EQ Component Needs			
		Unit	1975	1990	2020
1. & 2.	Erosion and sediment control				
	Cropland	acres			
	Rangeland	acres			
	Forestland	acres			
	Other	acres			
	Streambank, roads, etc.	miles			
3.	Effluent control				
	complete sewage facilities	each	41	21	0
	industrial waste facilities	each	4	0	0
4.	Irrigation water management	acres			
5.	Air pollution control	each	5	0	0
6.	Reduced water fluctuation	each			
7.	Protected riparian vegetation	acres	103,920	78,920	52,000
8.	Additional access facilities	each	39	19	0
9.	Protected open and green space	acres	All	All	All
10.	Free flowing streams	miles	all presently perennial	all presently perennial	all presently perennial

Item	Unit	Remaining EQ Component Needs 1975	1990	2020
11. Planned roads & utility lines	each	all new	all new	all new
12. Adequate minimum stream flows	miles			
13. Water temperature and fluctuation control of Hungry Horse	each	1	1	1
14. Adequate wildlife habitat				
Big game	acres	1,351,000	1,301,000	1,230,000
Upland	acres	12,500	9,700	5,900
Wetland	acres	---	---	---
15. Desirable fish migration				
Fish passage	each	1	1	1
16. Protected historical, archeological and cultural sites	sites	all	all	all

VIII. ALTERNATIVE PLANS

Alternative plans were developed to describe ways and means to meet the needs discussed in chapter VII. This chapter presents one plan with national economic development (NED) emphasis for OBERS level C projection needs; one NED emphasis plan for state-identified opportunities and needs; and one environmental quality (EQ) emphasis plan. From these three plans, a preferred plan, described in chapter IX, was synthesized to combine the best features of all three plans while creating the least amount of tradeoffs and dissatisfaction between the NED and EQ objectives. The plans will concentrate on early action elements to be accomplished by 1990. Longer-range plans for 2020 will be described in less detail.

NATIONAL ECONOMIC DEVELOPMENT PLAN--OBERS EMPHASIS

The NED OBERS emphasis plan shows production-oriented water and land development opportunities that could satisfy or help satisfy otherwise unmet requirements for the future-without-plan conditions.

Plan elements to meet the remaining needs shown in chapter VII include the following.

(1) Preserve, protect, and manage the better agricultural land and better commercial forest land for the production of food and fiber and maintain related basic industry. Means to accomplish this include improved land management and treatment and reduced movement of these lands into residential and wilderness uses. This would require identification and mapping of these better agricultural and commercial forest lands. Attract new manufacturing

industry into the basin to provide 5,000 additional man-years of basic employment above that available in 1970 in order to offset declines in extractive basic employment in agriculture, forest products, mining, and smelting and to provide a viable economy for the population expected in the future. The latter would be mainly a local government, chamber of commerce, or state government responsibility.

(2) By 1990 economic impacts from flood damages will be minimized by flood zoning and flood insurance and flood damage reduction is not considered a remaining need.

(3) Drain about ____________ acres of cropland now classed as I and II wetland under an accelerated program. Hay production on these acres will be increased by ___________ tons.

(4) Provide about ____________ acre-feet of supplemental water for ___________ acres now short of late-season water. Production increases from providing this supplemental water are estimated at _______ tons of hay and ______ AUM's of pasture per year. Adequate water is available for small grain production.

(5) Improve municipal water systems for _____ towns in the basin under accelerated programs. Assistance will be provided by FmHA and HUD.

(6)(7)(8) Outdoor recreation facilities will be adequately provided under ongoing programs and are not considered a remaining need.

(9) Provide fishing access at 40 additional sites under accelerated acquisition by Montana Department of Fish and Game with assistance from Bureau of Outdoor Recreation and other agencies. Access to public land will be provided at 19 additional sites by Forest Service, Bureau of Land Management, and Montana Department of State Lands under accelerated programs.

(10) Provide boat-launching ramps and floating docks by 1990 on six reservoirs that would not be so equipped under ongoing programs.

(11) Accelerate land treatment to increase production and improve efficiency of resource use on __________ irrigated acres; ________________ acres of dryland; ____________ acres of range; and ____________ acres of commercial forest. The following is a comparison of annual commodity needs as projected by OBERS and production that can be expected from current rates of land treatment and from accelerated land treatment. The remaining agricultural commodity needs would have to be met from additional irrigation development if OBERS projected demands were to be satisfied. These commodities would require about _________ acres of new irrigation and _________ acre-feet of irrigation water by 1990.

COMMODITY NEEDS TO MEET OBERS PROJECTIONS

Commodity	Unit	OBERS Projected Demand	To Be Met From Current Land Treatment	To Be Met From Accelerated Land Treatment	Remaining Commodity Needs
		- - - - - - - - - - - Thousands - - - - - - - - - - -			
1990					
Wheat	Bu.				
Feed grains	Bu.				
Hay	Tons				
Pasture	AUM's				
Range forage	AUM's				
Wood production	Cu.-Ft.	151,000	109,000	42,000	-0-
2020					
Wheat	Bu.				
Feed grains	Bu.				
Hay	Tons				
Pasture	AUM's				
Range forage	AUM's				
Wood production	Cu.-Ft.				

(12) Accelerate land treatment to protect ____________ acres of "other" land that would not be protected under current rates of ongoing programs.

(13) Accelerate thinning of 167,000 acres per year and reforest 25,000 acres per year on commercial forest land in order to increase the allowable cut of sawlogs and veneer logs by 37 million cubic-feet per year by 1990 and provide 2,600 additional man-years of basic employment.

(14) Accelerate forest products technology to increase the use of lower quality wood by five million cubic feet per year by 1990.

(15) Encourage more complete manufacture of wood products wherever economically possible in order to increase basic employment in the basin.

(16) Develop alternative plans to provide adequate electric power for the basin after 1990. Table VIII-1 summarizes this NED plan, its elements, and effects.

NATIONAL ECONOMIC DEVELOPMENT PLAN--ALTERNATIVE PROJECTION EMPHASIS

All plan elements included under the OBERS emphasis plan would be included in the alternative projection emphasis plan. In addition, a second NED plan was developed for the alternative projection emphasis. This latter plan assumes the irrigation of much of the potentially irrigable lands in both project and private developments--some of which may occur as part of the OBERS emphasis plan. The purpose of this second plan is to meet the state's expressed desire to produce a larger share of the world's agricultural commodities. A desirable effect of this would be to provide more employment in agricultural industries in the basin. By major drainages, irrigation developments are recommended as follows.

Flathead

(a) Enlarge storage and line canals on the Flathead Irrigation Project.

(b) Increase assistance and funding of conversion to sprinkler irrigation and private group pump units.

(c) Develop Creston Bench irrigation.

(d) Store supplemental water in Upper Stillwater Lake for use by private irrigation development.

(e) Develop group pump units for sprinkler irrigation of the Flathead delta between the head of the lake and Kalispell.

(f) Provide additional technical and financial assistance on the Flathead Irrigation Project for electrical facilities to accelerate completion of conversion to sprinkler irrigation.

Bitterroot

(a) Increase storage on Lake Como.

(b) Complete all practical lining of the Bitterroot Irrigation District (BRID) canals.

(c) Install all economically feasible gravity sprinkler systems.

(d) Rehabilitate the Ravalli Water Users Association diversions, canals, and control structures.

(e) Wherever practical, combine small parallel ditches and associated ditch companies for greater efficiency of delivery and administration.

(f) Develop additional water storage sites where feasible.

(g) Operate Painted Rocks Reservoir on the West Fork of the Bitterroot River to assure a full supply of late-summer water for all acres using direct diversion from the river.

Blackfoot

(a) Store additional water wherever economically feasible for use on existing irrigated acres and on new acres that are feasible to develop.

(b) Accelerate assistance to develop private pump-sprinkler projects.

(c) Improve Nevada Creek Water Users system.

Flint Creek

Develop additional storage for use on the Lower Willow and Flint Creek Water Users Association projects and on new acreages that are feasible to irrigate.

Deer Lodge and Little Blackfoot Valleys

Develop storage where feasible to provide late-season water on presently irrigated acres and for new irrigation.

Summary of New Irrigation

Anticipated developments would include the following acreages.

Drainage	Acres	Water Use
Flathead		
Bitterroot		
Blackfoot		
Flint Creek		
Deer Lodge Valley		
Little Blackfoot		

Development of these acreages of new irrigation would produce the following commodities as compared with those produced with land treatment.

COMMODITY PRODUCTION TO MEET ALTERNATIVE PROJECTION EMPHASIS

Commodity	Unit	To Be Met From Current Land Treatment	To Be Met From Accelerated Land Treatment	To Be Met From New Irrigation	Total Production
		- - - - - - - - -	Thousands	- - - - - - - - -	
1990					
Wheat	Bu.				
Barley	Bu.				
Hay	Tons				
Pasture	AUM's				
Range forage	AUM's				
Wood production	Cu.-Ft.	109,000	42,000	-0-	151,000

The alternative projection plan would produce more of the following commodities than would be produced under the OBERS emphasis plan.

Wheat	Bu.
Barley	Bu.
Hay	Tons
Pasture	AUM's

Table VIII-2 summarizes this NED plan, its elements, and effects.

ENVIRONMENTAL QUALITY PLAN

This EQ emphasis plan includes measures which could be developed for the preservation and enhancement of environmental conditions.

(1)(2) Accelerate land treatment to prevent erosion on __________ acres of cropland; __________ acres of rangeland; __________ acres of forest land; __________ acres of "other" lands. This will require additional funds and personnel.

(3) Increase funding for water pollution control. This would fund programs to:

- (a) control heavy metals and mine acid waste discharges.
- (b) eliminate pollution from sewage from communities and individual sewage systems.
- (c) eliminate pollution from other organic wastes such as from timber industries, roads, feedlots, etc.

(4) Accelerate conversion to sprinkler irrigation and irrigation water management practices to reduce pollution from return flows from irrigated lands. Accelerated technical and financial assistance would be required.

(5) The ongoing programs will control air pollution from major sources.

(6) Require all agencies and individuals to operate reservoirs in such a manner that scenic beauty is maintained. There would be no large drawdowns at any time. This would require new laws and compensation for losses to the owners of these reservoirs.

(7) Provide setback or vegetative greenbelts along streams and lakeshores to help preserve water site beauty and riparian habitat for waterfowl, furbearers, and recreation. This protection of riparian vegetation will be accomplished by purchase of easements and strict zoning laws. Subdivision and cropland uses of these areas would be eliminated.

(8) Develop additional access to public lands. Additional sites will help to alleviate the destruction of the present access sites due to overuse.

(9) Preserve natural beauty through:

- (a) prohibiting mobile homes, outbuildings, and structures that are in discord with natural surroundings.

(b) placing a moratorium on further subdivision and an esthetic compliance code for new buildings and restricting construction to presently subdivided tracts.

(c) improving logging methods to reduce logging road construction, damage to unharvested timber, erosion, and production of sediment.

(d) reforesting cutover land.

(e) enforcing weed control laws to enhance rural beauty.

(f) prohibiting landowners from abusing their land by overgrazing, exposure to erosion, etc.

(10) Preserve all major streams which are presently in a free-flowing state. Prevent the building of any dams on any of the major streams.

(11) Construct all roads and utility lines so they will harmonize with the natural beauty of the area.

(12) Provide sufficient streamflows for aquatic habitat by converting all irrigated lands to sprinkler irrigation and lining canals to reduce the total amount of water diverted for irrigation. In addition, minimum streamflows would be reserved, using the "Montana Method" as a guideline, for all streams. Where the above methods still do not provide enough water for fish and wildlife, small water control structures would be built in the upper watershed of the stream.

(13) Construct a multiple level outlet structure at Hungry Horse Dam that would permit temperature control by drawing water from different depths in the reservoir. Construct a reregulating reservoir on the South Fork below Hungry Horse to reduce river fluctuations that are damaging trout and salmon spawning areas and other aquatic production.

(14) Acquire, lease, or manage over one million acres of wildlife habitat. Private lands which contain big game winter range will be either purchased or leased. Public land management agencies will designate all big game winter ranges as special use areas to be managed to emphasize wildlife values. Terminate domestic livestock grazing permits which occur in these big game winter range areas or allow citizens (under an open bid concept) to obtain grazing permits on public lands for the purpose of enhancing wildlife populations. Provide food and cover areas on and near agricultural lands for upland game. Preserve all wetland areas for waterfowl habitat. Acquire, lease, manage, and enhance wetland types III and IV for waterfowl production.

(15) Provide fish passage around any present stream blockage. Prevent construction of any structure which blocks fish migration or passage.

(16) Protect, preserve, and enhance archeological, cultural, and historical sites.

Other

(a) Limit the inclusion of presently proposed wilderness study areas into the wilderness system. Develop new categories for land protection which allow the majority of these study areas to be protected for wildlife habitat, rare or endangered plants, special scenic areas, etc. These new categories should provide for intensive management of the resource which is being protected.

(b) Designate as scenic or wild rivers the streams which are presently under such study.

Table VIII-3 summarizes this EQ plan, its elements, and effects. Table VIII-4 is a summary table showing the effectivenss of the NED and EQ plans in meeting the objectives outlined in chapter III.

TABL. VIII-1--NED ALTERNATIVE PLAN - OBERS EMPHASIS--L ects As Compared With the Future Without Planning .tuation Estimate

	Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
						Beneficial Effects		Adverse Effects			
		Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	To the Basin $	To the Nation $	To the Basin $	To the Nation $	Beneficial Effects	Adverse Effects
1a.	Attract new basic manufacturing industry for 5,000 new jobs.			---	Land, energy, & construction materials required.					Maintain level of employment and standard of living.	Population growth as expected.
1b.	Stop subdivision of the better agricultural and commercial forest land.			Maintain scenic quality, wildlife habitat, & vegetation.	---					Same as above.	Building sites will become more expensive.
2.	No plan element for flood control.	---	---	--- ---	---	--	--	--	--	---	---
3.	Drain ______ acres of Type I & II wetland cropland to increase hay production ______ tons per year.			Some improved habitat for upland birds.	Reduced habitat for waterfowl.					Increased farm income. Decreased mosquitoes.	---
4.	Store ______ acre-feet supplemental water for ______ acres for increase of ______ tons hay and ______ AUM's pasture per year.			Increased late season instream flows where natural streams carry the irrigation water.	Reduced instream water flows except where natural streams are used to carry the irrigation water. Loss of ______ miles of free-flowing stream. Same as in 1a. above.					Increase incomes & improve economic stability.	---

TABLE VIII-1--NED ALTERNATIVE PLAN - OBERS EMPHASIS--Effects As Compared With the Future Without Planning Situation Estimate (Continued)

Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
					Beneficial Effects		Adverse Effects			
	Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	To the Basin $	To the Nation $	To the Basin $	To the Nation $	Beneficial Effects	Adverse Effects
5. Improve municipal water systems for 7 communities.			Minor, depending on type of system.	Land, energy, & materials required.					Safe drinking water without sediment or unpleasant odors & with adequate supplies for fire fighting.	
6,7,8. No plan element for recreational facilities.	--	--	---	---	--	--	--	--	---	---
9. 40 additional fishing access sites. 19 additional access sites to public land.			Reduce congestion, traffic & pollution at access sites.	Encourages more use of public land generally. More public use & pollution of streams & lakes. Minor loss of wildlife habitat.					Less congestion of recreationists. Reduced trespass.	
10. Boat launching ramps & docks for 6 reservoirs.			Reduced erosion at boat launching sites.	More pollution of reservoirs by fuels, oils, etc.					More even distribution of boats & improved safety.	More noise, traffic, & waves on reservoirs.
11. Accelerate land treatment to improve production on ____ irrigated acres; ____ acres dry cropland; ____ acres rangeland; 2,900,000 acres commercial forest			Reduced erosion & sedimentation. Increased terrestrial wildlife. Reduced non-point stream pollution. Improved visual esthetics.	Consumption of energy & materials. Some increased erosion on forest management roads.					Increased income, improved economic stability, & maintained agriculture & forestry.	---

TABLE VIII-1--NED ALTERNATIVE PLAN - OBERS EMPHASIS--Effects As Compared With the Future Without Planning Situation Estimate (Continued)

Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
					Beneficial Effects		Adverse Effects			
	Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	To the Basin $	To the Nation $	To the Basin $	To the Nation $	Beneficial Effects	Adverse Effects
12. Accelerate land treatment on "other" land.			Same as in 11. above.	Minor comsumption of energy and materials.					Maintain property values.	---
13. Accelerate thinning of 167,000 & reforest 25,000 acres of commercial forest per year to increase allowable annual cut of saw & veneer logs by 39 million cubic feet per year by 1990.			Improved wildlife habitat. Improved growth of trees & other plants.	Reduce some escape cover for big game.					Reduced fire hazard. Maintain forest employment 2,600 more jobs by 1990.	---
14. Accelerate forest products technology to increase use of lower quality wood.			Improved forest appearance. Improved growth of trees.	Disturbed wildlife in working areas.					Maintain jobs and improve economic stability.	---
15. More complete manufacture of wood products by local industry.				More consumption of energy in manufacturing more processing chemicals & industrial wastes.					Maintain jobs and improve economic stability.	---
16. More generation of electrical power after 1990.			More reservoir habitat.	Loss of stream habitat; more transmission corridors; some loss of terrestrial habitat, energy, land, & materials.					Maintain jobs; heat homes; protect health and economic stability.	---

TABLE VIII-2--NED ALTERNATIVE PLAN--ALTERNATIVE PROJECTION--Effects As Compared With the Future Without Planning Situation Estimate

Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
					Beneficial Effects		Adverse Effects			
	Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	To the Basin $	To the Nation $	To the Basin $	To the Nation $	Beneficial Effects	Adverse Effects
(Major plan elements are same as NED-CBERS elements.)										
ADDED IRRIGATION ELEMENTS:										
Flathead Drainage										
(a) Enlarge storage on Flathead Irrigation Project.			Minor change	Land, energy, & construction materials required. Increased fluctuation of reservoirs; some reduced stream flows.					Improved farm incomes.	---
(b) Line canals on the Flathead Irrigation Project.			Reduce nonpoint pollution from irrigation return flows.	Reduce flows in small streams within the project area. Reduced vegetation along canal. Energy & materials required.					Improved incomes in depressed area. Reduced mosquitoes.	---
(c) Creston Bench Irrigation Project.			Possible improved fishery on Lake Blaine.	Increase nonpoint source pollution from irrigation return flows. Enlarge Morning Creek. More variability of flow in Morning Creek. Energy & materials required.					Improved & more stable farm incomes.	---
(d) Enlarge Upper Stillwater Lake.			Improved late season instream flows.	Increased fluctuation of lake and reduced visual quality. Energy & materials required.					Improved and more stable incomes.	---

TABLE VIII-2--NED ALTERNATIVE PLAN--ALTERNATIVE PROJECTION--Effects As Compared With the Future Without Planning Situation Estimate (Continued)

Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
					Beneficial Effects		Adverse Effects			
	Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	To the Basin $	To the Nation $	To the Basin $	To the Nation $	Beneficial Effects	Adverse Effects
Bitterroot Drainage										
(a) Increase storage in Lake Como.			Possibly more fish habitat.	Energy & construction materials required. Increased reservoir fluctuations.					More stable farm incomes.	---
(b) Line canals in Bitterroot Valley.			Minor reduction of nonpoint pollution from irrigation return flows; some reduction in diversions.	Reduced vegetation along canals. Loss of some small wetland areas.					More stable farm incomes.	---
(c) Rehabilitate Ravalli Water Users System			---	Land, energy, and construction materials required & other minor effects.					More dependable irrigation water supply.	---
(d) Develop irrigation water storage on Eightmile Creek.			Create reservoir fishery. Reduced sediment in streams.	Land, energy, and materials required. Loss of one mile of natural stream to a reservoir.					Increased and stabilized income.	Minor hazard of dam failure.
Upper Clark Fork Drainage										
(a) Rehabilitate Nevada Creek Water Users System and line the canals.			Reduced pollution from irrigation return flows.	Eliminate or reduce some small wet areas along the canal caused by the present seepage.					Increased net income and safety.	

TABLE VIII-2--NED ALTERNATIVE PLAN--ALTERNATIVE PROJECTION--Effects As Compared With the Future Without Planning Situation Estimate (Continued)

Plan Elements	Economic Development Account Beneficial Effects $	Economic Development Account Adverse Effects $	Environmental Quality Account Beneficial Effects	Environmental Quality Account Adverse Effects	Regional Development Account Beneficial Effects To the Basin $	Regional Development Account Beneficial Effects To the Nation $	Regional Development Account Adverse Effects To the Basin $	Regional Development Account Adverse Effects To the Nation $	Social Well Being Account Beneficial Effects	Social Well Being Account Adverse Effects
(b) Develop additional irrigation & water storage for Lower Willow Creek & Lower Flint Creek area.			Improved late season instream flows; more reservoir-type fishery; repair seriously eroded area.	Loss of some beaver, deer, elk, & moose habitat & some free-flowing stream; more mud flat area & reservoir drawdown shore; land, energy, & construction materials required.					Increased real income & improved economic stability.	Minor increased hazard from dam failure/
Basin-Wide										
(a) Increase new sprinkler irrigation in other areas & develop group pump projects.				Reduce instream flows; increase non-point source pollution; energy & materials required; loss of wildlife habitat.					Improved & more stable incomes.	

TABLE VIII-3--EQ ALTERNATIVE PLAN--EFFECTS AS COMPARED WITH THE FUTURE WITHOUT PLANNING SITUATION ESTIMA

Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
	Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	Beneficial Effects		Adverse Effects		Beneficial Effects	Adverse Effects
					To the Basin $	To the Nation $	To the Basin $	To the Nation $		
1. & 2. Accelerate land treatment to prevent erosion on ____ ac. irrigated cropland; ____ ac. dry cropland; ____ ac. rangeland; ____ ac. forest; and ____ ac. "other" land.			Reduced erosion & sediment; reduced dust in the air; improved vegetation & wildlife habitat; improved visual esthetics.	Energy & materials required.					Increased satisfaction & pride in the area; increased economic stability.	---
3. Increased water pollution abatement to reduce heavy metals, acids, sewage, salts, & other organic wastes in streams.			Protected & improved aquatic habitat & improved health for people & animals.	Energy, land & materials required.					Reduced hazards to health.	Possible loss of jobs.
4. Accelerate conversion to sprinkler irrigation on presently irrigated land.			Reduced diversion of water, irrigation return flows, and associated nonpoint source pollution.	Reduced small wetland areas; increased energy requirements.					Increased and stabilized farm incomes.	---
5. No plan element for air pollution control.										

TABLE VIII-3--EQ ALTERNATIVE PLAN--EFFECTS AS COMPARED WITH THE FUTURE WITHOUT PLANNING SITUATION ESTIMATE (Continued)

Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
	Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	Beneficial Effects To the Basin $	Beneficial Effects To the Nation $	Adverse Effects To the Basin $	Adverse Effects To the Nation $	Beneficial Effects	Adverse Effects
6. Operate 11 reservoirs with negligible drawdown.			Improved reservoir fishery & esthetics. Reduced fluctuations of downstream flows.	Reduced late season instream flows; reduced feeding areas for shore birds.					Improved quality of recreation on reservoirs.	Reduced farm income, industrial income, & employment; less stable economy.
7. Provide protected & managed vegetative setback areas along streams & lakes.			Improved aquatic & riparian habitat; improved visual quality & reduced erosion.	Minor reduction of summer season instream flows.			Reduced land resource base.		Improved quality of recreation; reduced property loss.	More mosquitoes.
8. Develop 19 additional access sites to public lands.			Reduced destruction of vegetation and wildlife habitat around existing access sites.	Wider distribution of litter & loss of some wildlife habitat for construction of new sites.					Less frequent trespass; improved quality of recreation.	---
9. Preserve natural beauty: a. Prohibit location or construction of mobile homes, outbuildings, & structures not in harmony with natural surroundings.			Improved visual quality: reduced litter.						Improved utility service.	Reduced individual freedom of use of land; legally very difficult.

BLE VIII-3--EQ ALTERNATIVE PLAN--EFFECTS AS COM ED WITH THE FUTURE WITHOUT PLANNING SITUATION E ATE (Continued)

Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
					Beneficial Effects		Adverse Effects			
	Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	To the Basin $	To the Nation $	To the Basin $	To the Nation $	Beneficial Effects	Adverse Effects
9. (Continued)										
b. Discontinue subdivision & restrict building construction to presently subdivided tracts.			Protected visual quality; preserved habitat for big game animals.	More & larger buildings on presently subdivided land.					Improved utility service.	Same as for 9.a. Land now subdivided & available for buildings would become too expensive for average individual family dwellings & more apartment buildings would be built.
c. Use logging methods requiring fewer roads, preventing erosion, reducing damage to unharvested trees, & using irregular harvest patterns.			Reduced erosion & visual impact of logging; improved big game habitat, vegetation & forest production; reduced pollution from motorized vehicles.	Some effects of logging would remain.					Timber would remain available as a building material.	Less motorized access to timbered areas.
d. Reforest cutover land & manage stand growth for balanced timber & wildlife systems.			Improve vegetation, big game habitat, & visual quality.	---					Stabilize forest economy; increase real income.	---
e. Enforce weed control laws.			Improve visual quality.	Reduce bird habitat; introduce more herbicides into natural environment.					Increased satisfaction & pride in area & increased economic stability.	---

TABLE VIII-3--EQ ALTERNATIVE PLAN--EFFECTS AS COMPARED WITH THE FUTURE WITHOUT PLANNING SITUATION ESTIMATE (Continued)

Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
	Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	Beneficial Effects		Adverse Effects		Beneficial Effects	Adverse Effects
					To the Basin $	To the Nation $	To the Basin $	To the Nation $		
9. (Continued) f. Prohibit landowners from abusing land by overgrazing, erosion, etc.			Reduced erosion: improved visual quality, wildlife habitat, vegetation, and open & green space.						---	Limited freedom of use of land; legal problems.
10. Preserve all perennial streams in present free-flowing state.			Preserve aquatic habitat & maintain visual quality.	Continue with low late summer streamflows.					---	Reduced real income.
11. Construct all roads and utility lines to harmonize with natural surroundings.			Preserved natural beauty.	---						
12. Provide sufficient instream flows for aquatic habitat: a. Reserve instream flows. b. Construct small headwater reservoirs. c. Line irrigation canals to reduce seepage & irrigation diversion requirements.			Maintain & enhance aquatic life with improved instream flows.	Some small wetland areas would be reduced: materials & energy required.						

TAL VIII-3--EQ ALTERNATIVE PLAN--EFFECTS AS COMPARE ITH THE FUTURE WITHOUT PLANNING SITUATION ESTIM. (Continued)

Plan	lements	Economic Development Account		Environmental Quality Account		Regional Develcp-en* Account				Social Well Being Account	
						Beneficial Effects		Adverse Effects			
		Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	To the Basin $	To the Nation $	the in $	To the Nation $	Beneficial Effects	Adverse Effects
13.	Construct multi-level outlet structure & reregulating reservoir for Hungry Horse dam.			Improved downstream water temperatures & reduced diurnal flow fluctuations for improved aquatic habitat in Flathead River.	Large amounts of material & energy required.					River access & use would be safer.	---
14.	a. Acquire, lease, or manage 1,000,000 acres of wildlife habitat. Terminate domestic livestock grazing permits on public lands in big game winter range areas. Allow citizen groups to bid for & obtain big game grazing permits on existing public land grazing allotments.			Improved vegetative & big game habitat; reduced erosion.	Negligible						Reduced real income.
	b. Provide food & cover areas for upland game on agricultural land.			Improved wildlife habitat & reduced erosion.	Negligible						Reduced farm income.
	c. Preserve all wetland areas not already drained (124,700 acres) for waterfowl habitat. Acquire, lease, & manage all type III & IV wetland.			Increased population of waterfowl & other animals.	Negligible						Reduced farm income & more mosquitoes.

TABLE VIII-3--EQ ALTERNATIVE PLAN--EFFECTS AS COMPARED WITH THE FUTURE WITHOUT PLANNING SITUATION ESTIMATE (Continued)

Plan Elements	Economic Development Account		Environmental Quality Account		Regional Development Account				Social Well Being Account	
					Beneficial Effects		Adverse Effects			
	Beneficial Effects $	Adverse Effects $	Beneficial Effects	Adverse Effects	To the Basin $	To the Nation $	To the Basin $	To the Nation $	Beneficial Effects	Adverse Effects
15. Provide fish passage around all present stream blockages & prevent any future artificial blockage.			Enlarge fish populations.	Energy & materials required.					Minor secondary employment; increased recreation use of fishery.	---
16. Survey, nominate, preserve, protect, manage, develop, & enhance archeological, historical, and cultural sites.			Improved cultural, archeological, & historical resources.	Energy & materials required; identification may lead to destruction.					Improved cultural and educational values.	
Other:										
a. Enact new legal classifications, other than wilderness, for protection & enhancement of vegetation, wildlife, & other unique features.			Provide capability to protect & manage unique resources: protected open and green space & aquatic habitat.	---					Improved cultural & educational values.	Restricted access & reduced water & land use options.
b. Establish new wild & scenic river areas.										

TABLE VIII-4--SUMMARY TABLE--ALTERNATIVE PLANS

Alternative Plan	Plan Elements (Early Action 1990)	Unit	Plan Effectiveness 1990	
			Plan Provides	Remaining Needs
Plan A (NED) OBERS	1. Basic Employment:			
	Increased ag. production	Man-years		
	Increased forest products	"		
	Other manufacturing	"		
	Increased tourism	"		
	2. Flood Damage Reduction:			
	Flood plain zoning & insurance	Acres		
	3. Cropland Drainage:	Acres		
	4. Late Season Irrigation Water:			
	Diverted water	Acre-feet		
	Stored water	"		
	Improved transmission	"		
	5. Municipal Water:			
	New supply	Acre-feet		
	Improved facilities	Nos		
	6. Rural Recreation Facilities:			
	Camp sites	Nos		
	Picnic areas	"		
	Picnic tables	"		
	Boat ramps	"		

TABLE VIII-4--SUMMARY TABLE--ALTERNATIVE PLANS (Continued)

Alternative Plan	Plan Elements (Early Action 1990)	Unit	Plan Effectiveness 1990	
			Plan Provides	Remaining Needs
Plan A (NED) (Continued) OBERS	7. Urban Rec. Facilities:			
	Golf courses	Nos		
	Baseball fields	"		
	Outdoor basketball courts	"		
	Tennis courts	"		
	Swimming areas	"		
	Wading pools	"		
	Meeting rooms	"		
	Playgrounds	"		
	Gymnasiums	"		
	Craft rooms	"		
	Handball courts	"		
	8. Private Recreation:	Nos	None	None
	9. Public Recreation Access:			
	Law to limit liability of landowners			
	Fishing access points	Nos		
	Public land access points	Nos		
	Access easements			
	10. Reservoir Boat Ramps:	Nos		
	11. Land Treatment to Improve Production:			
	Irrigated land	Acres		
	Dry land	"		
	Range	"		
	Commercial forest	"		

TABLE VIII-4--SUMMARY TABLE--ALTERNATIVE PLANS (Continued)

Alternative Plan	Plan Elements (Early Action 1990)	Unit	Plan Effectiveness 1990	
			Plan Provides	Remaining Needs
Plan A (NED) (Continued) OBERS	12. Land Treatment to Protect "Other" Lands:	Acres		
	13. Increased Saw Timber:	Cubic feet		
	14. Increased Use of Other Wood:	Cubic feet		
	15. More Complete Mfg. of Wood Products:	Man-days		
	16. Increased Power Supply:	MGW		
	Commodity Production:			
	Irr. Crops:			
	Hay	Tons		
	Wheat	Bu		
	Barley	Bu		
	Pasture	AUM's		
	Non-Irrig. Products:			
	Wheat	Bu		
	Hay	Tons		
	Pasture	AUM's		
	Range forage	AUM's		
	Wood Production:			
	Saw and veneer logs	Cubic feet		
	Chips	"		
	Pulp	"		

TABLE VIII-4--SUMMARY TABLE--ALTERNATIVE PLANS (Continued)

Alternative Plan	Plan Elements (Early Action 1990)	Unit	Plan Effectiveness 1990 Plan Provides	Remaining Needs
Plan A (NED)	1. Basic Employment:			
STATE	Increased ag. production	Man-years		
	Increased forest products	"		
	Other manufacturing	"		
	Increased tourism	"		
	2. Flood Damage Reduction:			
	Flood plain zoning & insurance	Acres		
	3. Cropland Drainage:	Acres		
	4. Late Season Irrigation Water:			
	Diverted water	Acre-feet		
	Stored water	"		
	Improved transmission	"		
	5. Municipal Water:			
	New supply	Acre-feet		
	Improved facilities	Nos		
	6. Rural Recreation Facilities:			
	Camp sites	Nos		
	Picnic areas	"		
	Picnic tables	"		
	Boat ramps	"		

TABLE VIII-4--SUMMARY TABLE--ALTERNATIVE PLANS (Continued)

Alternative Plan	Plan Elements (Early Action 1990)	Unit	Plan Effectiveness 1990	
			Plan Provides	Remaining Needs
Plan A (NED) (Continued) STATE	7. Urban Rec. Facilities:			
	Golf courses	Nos		
	Baseball fields	"		
	Outdoor basketball courts	"		
	Tennis courts	"		
	Swimming areas	"		
	Wading pools	"		
	Meeting rooms	"		
	Playgrounds	"		
	Gymnasiums	"		
	Craft rooms	"		
	Handball courts	"		
	8. Private Recreation:	Nos	None	None
	9. Public Recreation Access:			
	Law to limit liability of landowners			
	Fishing access points	Nos		
	Public land access points	Nos		
	access easements			
	10. Reservoir Boat Ramps:	Nos		
	11. Land Treatment to Improve Production:			
	Irrigated land	Acres		
	Dry land	"		
	Range	"		
	Commercial forest	"		

TABLE VIII-4--SUMMARY TABLE--ALTERNATIVE PLANS (Continued)

Alternative Plan	Plan Elements (Early Action 1990)	Unit	Plan Effectiveness 1990 Plan Provides	Plan Effectiveness 1990 Remaining Needs
Plan A (NED) (Continued) STATE	12. Land Treatment to Protect "Other" Lands:	Acres		
	13. Increased Saw Timber:	Cubic feet		
	14. Increased Use of Other Wood:	Cubic feet		
	15. More Complete Mfg. of Wood Products:	Man-days		
	16. Increased Power Supply:	MGW		
	Commodity Production:			
	Irr. Crops:			
	Hay	Tons		
	Wheat	Bu		
	Barley	Bu		
	Pasture	AUM's		
	Non-Irrig. Products:			
	Wheat	Bu		
	Hay	Tons		
	Pasture	AUM's		
	Range forage	AUM's		
	Wood Production:			
	Saw and veneer logs	Cubic feet		
	Chips	"		
	Pulp	"		

CHAPTER VIII--SUMMARY TABLE--ALTERNATIVE PLANS

Alternative Plan	Plan Elements (Early Action 1990)	Unit	Plan Effectiveness--1990 Plan Provides	Remaining Needs
EQ	Erosion & sediment control			
1. & 2.	Cropland	Ac.		
	Rangeland	Ac.		
	Forestland	Ac.		
	Other	Ac.		
	Streambank, roads, etc.	Mi.		
3.	Effluent control			
	complete sewage facilities	Ea	21	0
	industrial waste facilities	Ea	0	0
4.	Irrigation water management	Ac.		
5.	Air pollution control	Ea	0	0
6.	Reduced water fluctuation	Ea		
7.	Protected riparian vegetation	Ac.	78,920	52,000
8.	Additional access facilities	Ea	19	0
9.	Protected open & green space	Ac.	All	All
10.	Free-flowing streams	Mi.	All presently perennial	All presently perennial
11.	Planned roads & utility lines	Ea	All new	All new
12.	Adequate minimum stream flows	Mi.		
13.	Water temperature and fluctuation control of Hungry Horse	Ea	1	1
14.	Adequate wildlife habitat			
	Big game	Ac.	1,301,000	1,230,000
	Upland	Ac.	9,700	5,900
	Wetland	Ac.	---	---

Alternative Plan	Plan Elements (Early Action 1990)	Unit	Plan Effectiveness--1990 Plan Provides	 Remaining Needs
EQ (Continued)				
15.	Desirable fish migration Fish passage	Ea.	1	1
16.	Protected historical archeological, and cultural sites	Sites	All	All

IX. PREFERRED PLAN

Chapter VIII presented an alternative plan emphasizing national economic development, a plan to increase the irrigated land area, and a plan to emphasize environmental quality. None of those plans presents the best mix of plan elements for improved quality of living or to satisfy the desires of the majority of the public which is concerned with the basin. Selected elements of each of the three plans in chapter VIII are combined in this chapter to develop a preferred plan acceptable to the majority of the public.

In the recommended compromise plan there are areas of complementarity in which both economic development and environmental quality are improved through resource development. Conversely, there are areas where development for one objective or component decreases the satisfaction of another objective or component. These are the areas in which tradeoffs were identified and plan elements were changed or deleted in order to develop the preferred plan.

Elements of the NED and EQ emphasis plans which can be complementary include:

-- moratorium on subdivision of good agricultural and commercial forest land

-- storage of excess spring runoff for later season use to provide ample water for both irrigation and fish and wildlife

-- reduction of all forms of pollution

-- acceleration of land treatment measures that preserve and enhance resources for long-term use, particularly sprinkler irrigation and improved timber management, harvest, and reforestation.

Plan elements which have some minor conflicts within the NED plan include:

-- storage and use of water to supplement irrigation water supplies and irrigation of additional land versus more hydroelectric power after 1990.

-- stopping the subdivision of the better agricultural and forest lands may make remaining building sites more expensive and make more expensive the attraction and location of new manufacturing industry for 5,000 new jobs.

Plan elements which have conflicts within the EQ plan include:

-- operate all reservoirs with negligible fluctuation versus provide sufficient instream flows for aquatic habitat.

-- preserve all perennial streams in present free-flowing state versus provide sufficient instream flows for aquatic habitat.

-- accelerate conversion to sprinkler irrigation versus preserve all wetland areas for waterfowl habitat.

-- line irrigation canals to reduce losses and irrigation diversion requirements versus preserve all wetland areas for waterfowl habitat.

-- enforced weed control laws versus increased funding for water pollution abatement.

Elements of the NED plans which conflict or adversely affect elements of the EQ plan include:

-- attract new manufacturing industry for 5,000 new jobs versus water pollution abatement.

-- draining cropland in Type I and II wetland conflicts with preserving all wetland areas for waterfowl habitat.

-- boat launching ramps and docks versus water pollution abatement.

-- more complete manufacture of wood products versus water pollution abatement.

-- more hydroelectric power after 1990 versus preserve all perennial streams in present free-flowing state and operate all reservoirs with negligible fluctuation.

-- line canals and increase sprinkler irrigation versus preserve all wetland areas for waterfowl habitat.

-- store supplemental irrigation water and more hydroelectric power after 1990 versus nominate, preserve, protect, and develop archeological, cultural, and historical sites.

-- that part of land treatment emphasizing agricultural production versus providing food and cover areas for upland game on agricultural land.

In the preferred plan it is recognized that we plan for the social and cultural well-being of people. Success of a plan depends on the ability of residents to earn a satisfactory living in a pleasing environment. The following NED plan elements are included in the preferred early action plan to be accomplished by 1990.

(1) Provide more manufacturing for export and more services to people from outside the basin in order to sustain basic employment for the present population and the increased population anticipated. The recommended

plan calls for a moratorium on subdivision of agricultural and commercial forested lands. That moratorium should not be lifted until all presently subdivided tracts are built on or unless a specific need for more tracts can be proved. Such action would preserve economic base resources in their present use and help maintain basic extractive income and employment.

(3) Drain about ____________ acres of cropland with high water table problems with a resulting increase of _______ tons of hay.

(4) Store excess spring runoff water on some streams for late-season irrigation of presently irrigated land, streamflow augmentation, and incidental flood reduction benefits. Locations of these storage sites, amounts of water storage, and purposes by water use are shown in table IX-1. This irrigation water would increase agricultural production by ______ tons of hay and ________ AUM's of pasture. There is adequate water at present for small grain production.

(5) Improve municipal water systems for _____ towns with assistance from FmHA and HUD.

(9) Acquire fishing access at 40 sites under accelerated programs of Montana Department of Fish and Game with assistance from BOR and other agencies. Provide public land access at 19 additional locations under accelerated programs of FS, BLM, and Montana Department of State Lands.

(10) Provide boat launching ramps and floating docks on six reservoirs under accelerated programs of Montana Department of Fish and Game with assistance from BOR.

(11) Accelerate land treatment to increase production on __________ irrigated acres; __________ dryland acres: ______________ range acres; and __________ acres of commercial forest.

(12) Accelerate land treatment to protect __________ acres of "other" lands.

(13) Accelerate forest thinning by 167,000 acres per year and reforestation will be increased by 25,000 acres per year to increase sawlog and veneer log production by 37 million cubic feet per year.

(14) Accelerate application of forest product technology to increase the use of lower quality wood by five million cubic feet per year.

(15) Encourage, where feasible, more complete manufacture of wood products.

(16) Provide more electric power after 1990.

Environmental Quality plan elements included in the preferred early action plan for 1990 include the following.

(1)(2) Accelerate technical and financial assistance to eliminate erosion and sediment production on ______________ acres of dry cropland; ______________ acres of range; ______________ acres of forest land; ____________ acres of other lands; and __________ miles of roads and trails.

(3) Provide technical and financial assistance to control water pollution.

(4) Accelerate conversion to sprinkler irrigation and other irrigation water management measures to reduce water pollution from return flows and to reduce the amount of water that needs to be diverted from streams.

(6) Operate reservoirs, within practical limits, to minimize drawdown and exposure of mudflats during the summer.

TABLE IX-1

Irrigation and Streamflow Augmentation Storage Recommendations

(7) Protect riparian vegetation on ____________ acres along streams and lakeshores under easements, acquisition, and zoning programs.

(8) Provide additional access to public lands to help disperse recreational use and thereby reduce overuse and environmental destruction of the present access sites.

(9)(11) Preserve and protect present open and green space through legislation that would require a moratorium on subdivisions, an esthetic compliance code for new buildings, improved logging methods and selective harvest of timber, and careful design and construction of roads and utility lines to harmonize with natural beauty of the area.

(10) Preserve fishery class 1, 2, and 3 streams in their free-flowing state under wild and scenic river designations. Through 1990, new hydroelectric power development would be limited to Buffalo Rapids units 2 and 4.

(12) Reserve minimum streamflows for all live streams using a modified version of the "Montana Method." That modified method would not require minimum flows in excess of the natural low level base flow as determined by an average of measured flows from September 30 through March 31 for the years of record. Owners of water rights for irrigation would be indemnified from Montana Department of Fish and Game funds for loss of production due to meeting minimum flow requirements. Conversely, all irrigation water users would be required to use all economically feasible means to improve their irrigation efficiencies.

(13) Provide a multiple stage outlet to modify the temperature of water released from Hungry Horse Reservoir during trout and salmon spawning periods. Build a reregulating dam on the South Fork of Flathead

River below Hungry Horse Reservoir to reduce the fluctuating flows from the reservoir which damage trout and salmon spawning redds and aquatic food production.

(14) Manage wildlife habitat for wildlife. Private lands will be either purchased or leased and public land agencies will designate all critical big game ranges and wetlands as special use areas and manage them to protect wildlife habitat. Domestic livestock grazing permits will be terminated on these big game winter range areas, or as an alternative, environmentally oriented citizens will be allowed (under open bid concept) to obtain these grazing permits for wildlife use. Upland game bird habitat will be developed on and near agricultural areas. All wetland types III and IV will be acquired and enhanced for waterfowl and only types I and II that are now in cropland will be allowed to be drained.

(15) Improve fish passage around Big Fork dam and through any obstructing culverts or bridges now in place. Install new construction in such a manner to ensure adequate fish passage.

(16) Develop areas of particularly significant historical, archeological, biological, or geological interest for public viewiang and protect other areas from destruction by other types of development, exploiters, and vandals.

OTHER

Establish new environmental categories to protect areas for their particular attraction, such as wildlife habitat, rare or endangered plants, and special scenic areas. Designate the three forks of the Flathead as wild and scenic rivers.

Items included in the preferred plan are shown in table IX-2 along with their costs and related changes in production or effects.

TABLE IX-2

Item	Units	Quantity	Beneficial Effects	Adverse Effects

TABLE IX-3--EFFECTIVENESS OF PREFERRED PLAN IN SATISFYING PROJECTED 1990 NEEDS AND DESIRES
CLARK FORK OF THE COLUMBIA RIVER BASIN

Components	Units	Unmet Needs From Chapt. VII	Amount Plan Provides	Remaining Needs	RELATED COMMODITIES PROVIDED BY PLAN ELEMENT PER YEAR					
					Wheat	Feed Grains	Hay	Pasture & Range	Sawlogs & Veneer Logs	Other Wood
					Bushels	Bushels	Tons		Million Cu. Ft.	Million Cu. Ft.
NED EMPHASIS:										
(1) Basic Employment	Man-Years	-0-								
(2) Flood Prevention	Acres									
(3) Cropland Drainage	Acres									
(4) Supplemental Irrigation										
Land now irrigated	Acres									
Water	Ac.-Ft.									
(5) Municipal Water Systems Improvement	Each									
(6) Rural Recreation Facilities	Nos.	-0-								
(7) Urban Recreation Facilities	Nos.	-0-								
(8) Private Recreation Facilities	Nos.	-0-								
(9) Public Rec. Access										
Fishing Sites	Nos.	40	40	-0-						
Public Land Sites	Nos.	19	19	-0-						
(10) Reservoir Boating Facilities	No. Res.	6	6	-0-						
(11) Land Treatment to Increase Production:										
Irrigated Land	Acres									
Dryland	Acres									
Range	Acres									
Commercial Forest	Acres	3,805,000							37	
(12) "Other" Land Treatment	Acres									
(13) Commercial Forest Thinning (per year)	Acres	167,000							(37)	
Reforestation (per year)	Acres	25,000								
(14) Other Wood Use	Mil. Cu.Ft.	5	5	-0-						5
(15) More Wood Mfg.	Man-years									
(16) Electric Power	Mil. KW hrs.	-0-								

OBERS PROJECTED COMMODITY NEEDS

REMAINING COMMODITY NEEDS

TABLE IX-3--EFFECTIVENESS OF PREFERRED PLAN (Continued)
CLARK FORK OF THE COLUMBIA RIVER BASIN

Components and Elements	Units	Unmet Needs From Chapter VII	Amount Plan Provides	Remaining Needs
EQ Emphasis:				
(1)(2) Erosion & Sediment Control:				
Cropland	Acres			
Rangeland	Acres			
Forest Land	Acres			
Other Land	Acres			
Streams & Roads	Miles			
(3) Sewage & Industrial Waste Treatment:				
Towns & Cities	Nos.			
Industrial Sites	Nos.			
(4) Irrigation Runoff Control	Acres			
(6) Reduced Reservoir Fluctuation	No.Res.			
(7) Preserve Riparian Vegetation	Acres			
(8) Recreation Dispersion More Access Points	Nos.	19	19	0
(9) Preserve Open & Green Space	Acres			
(10) Preserve Free Flowing Streams	Miles			
(11) Control Placement of Roads and Utilities	Miles			
(12) Minimum Streamflow Preservation	Miles			
(13) Hungry Horse Res. Discharge Control:				
Temperature Outlet Str.	Each	1	1	0
Reregulating Res.	Each	1	1	0
(14) Wildlife Habitat Development:				
Big Game Range	Acres			
Upland Game Bird Habitat	Acres			
Wetland Habitat	Acres			
(15) Fish Passage Around Obstructions	Structures			
(16) Preservation of Historical, Archeological, and Other Special Areas	Sites			

TABLE IX-4--SUMMARY COMPARISON BETWEEN PREFERRED PLAN AND OTHER ALTERNATIVE PLANS
CLARK FORK OF THE COLUMBIA RIVER BASIN

Accounts and Items	Plan A NED OBERS EMPHASIS	Plan B NED STATE EMPHASIS	Plan C Environmental Quality	Plan D Preferred Plan	Plan D Minus Plan A	Plan D Minus Plan B	Plan D Minus Plan C
1. National Economic Dev: ($1,000)							
Beneficial Effects	$	$	$	$	$	$	
Adverse Effects	$	$	$	$	$	$	
Net Beneficial Effects	$	$	$	$	$	$	
2. Environmental Quality: Beneficial & Adverse Effects							
A. Reduction of erosion & sediment			Land treatment on ___ acres	Land treatment on ___ acres			
B. Reduction of municipal & industrial pollution			___ sewage plants ___ industry impr.	___ sewage plants ___ industry impr.			
C. Reduction of irrigation runoff			Land treatment on ___ acres	Land treatment on ___ acres			
E. Preserve & enhance natural beauty			Improved at sites	Improved at sites			
Min. Streamflows			Subdivision Moratorium Stop reservoir fluctuation	Subdivision Moratorium			
F. Preserve & enhance wildlife habitat							
Big game			___ acres	___ acres			
Upland			___ acres	___ acres			
Wetland			___ acres	___ acres			
G. Preserve & enhance archeological & historical & other special sites			___ archeo. sites ___ historic sites ___ special sites	___ archeo. sites ___ historic sites ___ special sites			
H. Other							
3. Regional Development:							
A. Income ($1,000)							
Beneficial effects	$	$	$	$			
Adverse effects	$	$	$	$			
Net beneficial effects	$	$	$	$			
B. Employment Net Beneficial effects	___ man-years/yr.	___ man-years/yr.	___ man-years/yr.	___ man-years/yr.			
4. Social Well-Being:							
A. Man-years Employment for low income sector	___ man-years/yr.	___ man-years/yr.	___ man-years/yr.	___ man-years/yr.			
B. Flood Damage Impact Reduction	Flood zoning and flood insurance ___ communities	Flood zoning and flood insurance ___ communities	Flood zoning and flood insurance ___ communities	Flood zoning and flood insurance ___ communities	-0- difference	-0- difference	-0- difference
C. More Reliable Water Supply							
D. Improved Quality of of Recreation	Dispersed by 59 more access sites & 6 reservoir boat ramps & docks	Dispersed by 59 more access sites & 6 reservoir boat ramps & docks	Dispersed by 59 more access sites & 6 reservoir boat ramps & docks	Dispersed by 59 more access sites & 6 reservoir boat ramps & docks	-0- difference	-0- difference	-0- difference